Midyear Review Report FY 2001

May 2001

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Pacific Northwest National Laboratory
Richland, Washington 99352

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Executive Summary

The U.S. Department of Energy continues to face a major radioactive waste tank remediation problem with hundreds of waste tanks containing hundreds of thousands of cubic meters of high-level waste and transuranic waste across the DOE complex. These tanks must be maintained in a safe condition and eventually remediated to minimize the risk of waste migration and/or exposure to workers, the public, and the environment. However, programmatic drivers are more ambitious than baseline technologies and budgets will support. Science and technology development investments are required to reduce the technical and programmatic risks associated with tank remediation baselines.

The Tanks Focus Area was initiated in 1994 to serve as the DOE Office of Environmental Management's national science and technology development program for radioactive waste tank remediation. The national program was formed to increase integration and realize greater benefits from the science and technology development budget. The TFA is responsible for managing, coordinating, and leveraging science and technology development to support the needs of DOE's five major tank sites: Hanford Site (Washington), Idaho National Engineering and Environmental Laboratory (Idaho), Oak Ridge Reservation (Tennessee), Savannah River Site (South Carolina), and West Valley Demonstration Project (New York). While not one of the five "official" TFA tank sites, the TFA also supports the Fernald Environmental Management Project (Ohio), by providing technical assistance as needed.

In accordance with EM guidance, the TFA conducted a Midyear Review to validate and document the program's technical strategy as well as the maturity and progress of the projects in its portfolio. The initial phase of the review occurred February 12-26, 2001, and focused on assessing the completeness and adequacy of the TFA's technical strategy in response to user science and technology needs. The second phase of the review was conducted March 12-14, 2001, in Salt Lake City, Utah, and involved either detailed technical or status reviews of selected TFA and Environmental Management Science Program projects. The technical reviews focused on: project relevance to user needs; technical merit and cost effectiveness; environmental, safety and health risks; and viability of delivering the technical solution, including user readiness and commitment. Depending on the stage of the project, status reviews focused on project plans, progress, or lessons learned, and opportunities for transfer of technology and experience to other sites or applications. Key program, technical, and advisory personnel participated in these reviews.

This report provides an explanation of the TFA review process, an overview of the program, and highlights the results of the Fiscal Year 2001 Midyear Review.

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Contents

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Acronyms

AEAT	AEA Technology
Al	aluminum
ALARA	As Low As Reasonably Achieveable
ASME	American Society of Mechanical Engineers
ASTD	Accelerated Site Technology Deployment
AWR	Advanced Waste Retrieval
BDGRE	buoyant displacement gas release events
BNL	Brookhaven National Laboratory
CCM	cold crucible melter
CCIM	cold crucible induction melter
CEMS	Continuous Emission Monitoring System
CERCLA	Comprehensive Environmental Resource Conservation and Liabilities Act
CFD	computational fluid dynamics
CHG	CH2M Hill Hanford Group
CMST	Characterization, Monitoring, and Sensor Technology Crosscutting Program
CNDE	Center for Nondestructive Evaluation
Cr	chromium
Cs	cesium
CST	crystalline silicotitanate
CV	compositional variability
CVS	compositional variability system
DCMS	Dual Coriolis Monitoring System
D&D	decontamination and decommissioning
DDFA	Deactivation and Decommissioning Focus Area
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy Headquarters
DOE-ID	DOE Idaho Operations Office
DOE-OR	DOE Oak Ridge Operations Office
DOE-RL	DOE Richland Operations Office
DOE-SR	DOE Savannah River Operations Office
DST	double-shelled tank
DWPF	Defense Waste Processing Facility
EIS	environmental impact statement

EM	Office of Environmental Management (DOE)
EMSP	Environmental Management Science Program
EN	electrochemical noise
EPA	Environmental Protection Agency
ESH	Environmental Safety & Health
ESP	Efficient Separations Crosscutting Program
ESP	Environmental Simulation Program
F	fluorine
FIU	Florida International University
F&DR	functions and design requirements
FY	fiscal year
GAAT	Gunite and Associated Tanks
HEPA	high-efficiency particulate air (filter)
HFIR	High Flux Isotope Reactor
HLW	high-level waste
HP/CORD	permanganic acid/chemical oxidation reducing decontamination
HWRS	Heavy Waste Retrieval System
ICCM	induction cold crucible melter
LDRD	Laboratory-directed Research and Development
ILAWPA	Immobilized Low Activity Waste Performance Assessment
IMS	ion mobility spectrometry
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IPL	Integrated Priority List
ISMS	Integrated Safety Management System
IUOE	International Union of Operating Engineers
JCRWM	Joint Committee for Radioactive Waste Management
KRI	Klopin Radium Institute
LANL	Los Alamos National Laboratory
LAW	low-activity waste
LDUA	Light Duty Utility Arm
LFCM	liquid-fed crucible melter

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSU	Mississippi State University
MYPP	Multiyear Program Plan
MYTR	Multiyear Technical Response
Na	sodium
NACE	National Association of Corrosion Engineers
NDE	nondestructive examination
NETL	National Energy Technology Laboratory
NGLW	newly generated liquid waste (at INEEL)
NOx	nitrates
ORNL	Oak Ridge National Laboratory
ORP	Office of River Protection (DOE)
ORR	Oak Ridge Reservation
OST	Office of Science and Technology (EM)
PA	performance assessment
PE	professional engineer
PEG	Program Execution Guidance
PI	principal investigator
PMP	Pulsating Mixer Pump
PNNL	Pacific Northwest National Laboratory
Pu	plutonium
RCRA	Resource Conservation and Recovery Act
R&D	research and development
Robotics	Robotics Crosscutting Program
RPE	Retrieval Performance Evaluation
RPP	River Protection Project
RW	Office of Radioactive Waste Management (EM)
SAFT	synthetic aperture focusing technique
SBW	sodium-bearing waste
SCFA	Subsurface Contaminants Focus Area
Si	silicon
SME	subject matter expert
SOx	sulfur oxides
SPP	Salt Processing Project

Sr	strontium
SREX	strontium extraction
SRS	Savannah River Site
SRTC	Savannah River Technology Center
SST	single-shell tank
STCG	Site Technology Coordination Group
TAG	Technical Advisory Group
Tc	technetium
TFA	Tanks Focus Area
TIM	Technology Integration Manager
TMS	Topographical Mapping System
TRIAD	nickname for the integrated pretreatment system at ORR (Crossflow Filtration, Out of Tank Evaporator and Cesium Removal System)
TRUEX	transuranic extraction
TSAFT	tandem synthetic aperture focusing technique
TSDS	Technology Safety Data Sheet
TTP	Technical Task Plan
TWG	Technical Working Group
UNEX	universal solvent extraction
USG	User Steering Group
UV	ultraviolet
VCO	Voluntary Consent Order
VEMP	Vitrification Expended Materials Processing
WAPS	Waste Acceptance Product Specifications
WASRD	Waste Acceptance System Requirements Document
WIPP	Waste Isolation Pilot Plant
WIR	waste incidental to reprocessing
WSRC	Westinghouse Savannah River Company
WTP	Waste Treatment and Immobilization Plant
WVDP	West Valley Demonstration Project
WVNS	West Valley Nuclear Services
Zr	zirconium

1.0 Introduction

The Tanks Focus Area (TFA) was initiated in 1994 to serve as the U.S. Department of Energy (DOE) Office of Environmental Management's (EM's) national science and technology development program for radioactive tank waste remediation. This national program was formed to increase integration and realize greater benefits from DOE's science and technology budget.

1.1 Purpose of the Reviews

In accordance with EM's Office of Science and Technology (OST), the TFA is committed to validating its technical strategy and assessing the merit and maturity of technology development projects to ensure their readiness for demonstration and deployment. Adhering to OST guidance, the TFA conducts an annual Midyear Review to evaluate its technical strategy and plans, review and status ongoing projects, reaffirm and document user commitment to selected projects, and improve the effective deployment of technology by determining and documenting the readiness of selected projects to move ahead.

The TFA Midyear Review is a key element in the overall TFA review strategy. This strategy is outlined in Appendix A. The Midyear Review Report contains an overview of the status of all TFA fiscal year (FY) 2001 active projects and the midyear reviews conducted on these projects. These projects and reviews are summarized in Appendix B. Note that not all the reviews are conducted during the Midyear Review, as TFA uses a phased approach to address Midyear Review requirements while ensuring review timing is appropriate to the project stage and schedule.

1.2 Multiyear Technical Response Review

The initial phase of the TFA Midyear Review occurred February 12-26, 2001, and focused on assessing the completeness and adequacy of the TFA's current and planned technical strategy in response to user needs. The TFA FY 2002-2004 Multiyear Technical Responses (MYTRs), including new scope as well as ongoing FY 2001 tasks with continuing applicability based on the most current set of site user needs, were provided to the site users for review and comment. The site user review panel is identified in Appendix C. The MYTRs were revised as appropriate based on the user comments received. Appendix D contains the users comments and recommendations and TFA's response.

1.3 Midyear Review Meeting

The second phase of the Midyear Review, held on March 12-14, 2001, in Salt Lake City, Utah, involved a smaller set of ongoing FY 2001 projects. Projects reviewed during this phase were selected considering the following factors: approaching a key milestone, decision point or maturity level/gate determination; experiencing technical or programmatic issues; scheduled for a review; or

providing an opportunity to communicate plans or lessons learned deemed beneficial to the TFA user community.

During this phase, two types of reviews were conducted: technical reviews and status reviews. Technical reviews involved detailed assessments using project specific review criteria and focusing on the project's relevance to user needs, technical merit and cost effectiveness, environmental safety and health (ES&H) risks, and the viability of delivering the technical solution. The intent of this type of review was to assess the quality and technical validity of the work performed and to determine the readiness of these projects to deliver as scheduled, including determining the commitment and readiness of the site user to accept the technical solutions. Status reviews were less in-depth, used general review criteria, and focused on project plans, progress, or lessons learned, depending on the stage of the project. For newer projects, the focus of the status review was on the technical strategy and planned work. For projects at or nearing completion, the status review focused on the results and benefits of the work, lessons learned, and opportunities for transfer of technology and experience to other sites or applications.

Seven TFA projects received a technical review and twenty-four TFA projects received a status review. In addition, a status briefing on the work and its relevancy to TFA was provided on twelve Environmental Management Science Program (EMSP) projects. In support of the Midyear Review, Project Maturity Status Determination (i.e., Gate) checklists were developed for all FY 2001 active projects. These checklists can be viewed at TFA's web site at: *http://www.pnl.gov/tfa/documents/FY01checklist/index.stm*.

The Principal Investigators (PI) presented the project review information. For the technical reviews, this included information on the user need and the site(s) and problem(s) to which the need applies, the technical approach, results of work to date, and readiness to proceed to the next stage of development or delivery (including user readiness and commitment to accept the technology or recommendations). For status reviews, this included communication of project plans, status, or lessons learned, and opportunities for technology or experience transfer to other sites/applications.

The review panel for this meeting consisted of members of the TFA Management Team, the TFA User Steering Group (USG), the TFA Technical Advisory Group (TAG) and the TFA Technical Team (see Appendix C for a detailed listing of the reviewers). The reviewers were requested to engage in discussions, examine any programmatic or technical issues, and provide comments and/or recommendations. To assist in their preparation for the meeting, the TAG was provided advance materials that included review criteria for both technical and status reviews (Appendix E) and background information on the projects receiving technical reviews. The review criteria were also provided to the user reviewers (i.e., TFA Management Team and the USG) to support their review to ensure the projects' development/progress is consistent with users needs, schedules, and readiness and commitment to deploy. A summary of the project reviews is provided in Section 3. Specific review comments and recommendations, and the TFA responses, are included in Appendix F. A summary of the actions resulting from the Midyear Review Meeting is provided in Appendix G.

Also at the Midyear Review Meeting, representatives of the TFA and the International Union of Operating Engineers (IUOE) met to discuss the new OST review requirement for Technology Safety Data Sheet (TSDS) evaluations for a few first priority projects in FY01, and the TFA and IUOE roles and responsibilities. Three TFA projects have been selected to pilot TSDS evaluations and pertinent background information on each has been provided to the IUOE representative. Following the meeting, the TFA and IUOE representatives began working on scheduling the evaluations and the process for conducting the evaluations. The projects selected for TSDS evaluation are reflected in Appendix H.

2.0 Overview of the Program

The TFA is responsible for managing, coordinating, and leveraging science and technology development to support the needs of DOE's five major tank sites: Hanford Site (Washington), Idaho National Engineering and Environmental Laboratory (INEEL) (Idaho), Oak Ridge Reservation (ORR) (Tennessee), Savannah River Site (SRS) (South Carolina), and West Valley Demonstration Project (WVDP) (New York). The TFA also supports the Fernald Environmental Management Project (Fernald) (Ohio), by providing technical assistance as needed.

The TFA's technical scope covers the major functions that comprise a complete tank remediation system: waste storage, waste retrieval, waste pretreatment, waste immobilization, tank closure/waste disposal, with safety and characterization and monitoring (of both the waste and tank) integrated into all the functions. The TFA helps integrate program activities across a number of organizations that fund tank science and technology development, including the DOE Offices of Site Closure, Project Completion, and Science and Technology.

2.1 TFA Program Mission and Goals

The TFA mission is to work with users to develop, deliver, and implement integrated technical solutions to safely and efficiently accomplish tank waste remediation at five major DOE sites: Hanford Site, INEEL, ORR, SRS, and WVDP. Inherent to this mission, the TFA seeks to:

- Provide technical solutions to enable and enhance remediation
- Respond to the unique technical challenges inherent in the TFA program mission
- Work with users and program partners through the entire process, from problem identification to implementation of technical solutions
- Focus on filling technical gaps and making tangible progress toward solving key tank problems.

The TFA has developed more detailed goals and objectives and these can be found in TFA's FY 2001-2005 Multiyear Program Plan (MYPP).

Needs submitted by user (site) organizations provide the foundation for the TFA's technical program. The TFA analyzes individual site needs and develops technical responses to address the needs. Users then review the technical responses for applicability and adequacy to the submitted site need. This focus on the user has increased the responsiveness of the TFA to deliver and implement technical solutions across the sites. An increased emphasis on science and applied research, and longer-term strategic tasks will enhance the ability of

TFA's investment portfolio to solve both near-term user needs and longer-term, higher risk, and higher payoff user needs.

2.2 FY 2001 Program Progress

Significant events and activities thus far in FY 2001 include:

- The TFA is continuing to provide valuable technical assistance to INEEL in support of the site's High Level Waste and Facilities Disposition Environmental Impact Statement. TFA conducted independent technical reviews of INEEL's technology roadmaps for vitrifying sodium bearing waste (SBW) and calcine waste. TFA also conducted an independent technical review of the applicability of the Studsvik, Inc. Thor sm process for treating the SBW.

- The TFA provided technical assistance to Fernald, by conducting an independent technical review of the designs for the retrieval systems for Silos 1 and 2.

- The TFA coordinated an Advanced High-level Waste Melter and Waste Products Review. This independent review is investigating ways to reduce costs (within reasonable risks) for high-level waste (HLW) processing, immobilization, storage and disposal (e.g., improved waste formulations, loadings, melt characteristics, waste forms, melters) and will be providing recommendations on future melter research and development activities within TFA and EM.

- The TFA has made progress in strengthening relationships with the EMSP staff, to make the program more relevant and of impact to EM HLW issues, including:

  - TFA provided assistance in the selection of EMSP projects relevant to site needs and programs. TFA worked directly with the site users to identify and develop the needs for the FY 2001 HLW EMSP proposal call

  - TFA continues to suggest methods to strengthen the EMSP proposal relevancy review, so that EMSP projects clearly relevant to HLW needs and programs are initiated and renewed

  - TFA assisted in increasing communications/interactions between the EMSP PIs and the site users by involving 12 recently renewed EMSP projects in TFA's FY 2001 Midyear Review

  - TFA is spearheading an effort to better communicate EMSP project information. The effort involves screening and selecting publications from relevant EMSP projects for distribution to site users.

- The TFA prepared technical responses to 170 science and technology needs received from the five tank sites. User review reflected an overall positive endorsement of the proposed technical program.

- The TFA's Applied Research solicitations to industry and the national laboratories were issued by the National Energy Technology Laboratory (NETL) in February and March.

- A HLW EMSP Solicitation was released to universities and national laboratories by the EMSP on January 16, 2001. TFA worked with tank users and technical experts to identify science needs falling in four major call topic areas – long-term issues relating to tank closure, high efficiency/high through-put separations, immobilization methods and materials, and innovative characterization methods.

- An enhanced electrochemical noise (EN) multifunction corrosion probe was deployed in a Hanford double-shell tank (DST). An integrated monitoring system was also installed and connected to the EN probe.

- A sampling tool was deployed in tank 8D-2 at WVDP to support tank waste retrieval and tank closure decisions.

- The Russian Pulsating Mixer Pump (PMP) was deployed at Oak Ridge.

Key FY 2001 deliverables and/or DOE-Headquarters (HQ) level milestones achieved to date include:

- Submission of the report on INEEL's FY 2000 glass formulation (A9773)

- Deployment of the sampler tool in Tank 8D2 (A9361)

- Deployment of the Russian PMP (A9359)

- Deployment of the enhanced version of the EN corrosion probe in a DST (A9143)

- Issuance of the Salt Processing Project (SPP) Research and Development Program Plan, Rev.1 (A9570)

- Performance of the first research scale melter run to support INEEL's flowsheet development (A9768)

- Issuance of the report on the deployment of the Gunite and Associated Tank (GAAT) Heavy Waste Retrieval System (HWRS) (A9367)

- Review of the outline design for the mobile sampler (A9246)

- Issuance of the SPP High Flux Isotope Reactor (HFIR) Test Results Report (A9570)

- Issuance of the SPP Problem Solutions and Pretreatment Modifications Report (A9570)

- Comparison of the Environmental Simulation Program (ESP) Model with saltcake dissolution (A9554)

- Deployment of the Gamma Camera (A9361)

Progress on significant technologies/projects includes:

- Remote Systems for Pit Operations and Maintenance/ Hanford Enhanced Pit Operations (A9352). FY 2001 workscope focuses on completion of cold testing of the enhanced pit operations system, and conducting hot demonstration (deployment) in the fourth quarter. The project experienced delays in mid-FY 2001 due to vendor delivery problems with the key manipulator system. However, the project is moving forward with final deployment of the Pit Viper system, which is expected to result in decreased decontamination costs, reduced personnel exposures, and more readily available riser pits for supporting deployment of tank waste retrieval equipment.

- SPP Technical Research and Development (A9570). At the request of DOE, the TFA providing direct oversight and management of the research and development efforts associated with the SPP. Project activities are focused on conducting the necessary research and development for four primary technology alternatives for separating selected radionuclides from HLW prior to vitrification. Recommendations to DOE-EM regarding the remaining pre-down-select research and development priorities were provided. Evaluation of the key alternatives necessary for the down selection recommendation was completed in March and the results presented in the SPP Research and Development Summary Report delivered to the Technical Working Group (TWG) on May 25, 2001. The Summary Report is TFA's evaluation of the research and development conducted over the past year to support a down-selection decision.

- Specify and Enhance Design and Operation of HLW Melters/ INEEL Direct Vitrification of SBW (A9768). The TFA is supporting INEEL in implementing the science and technology required to support Title 1 design, construction, and operations of a vitrification treatment system for SBW. Work activities include waste formulation development and testing, and melter selection, testing and scale-up in support of a 2008-2010 deployment. The first research scale melter test run has been completed, and the test report is underway. The results of this and the small-scale melter test will provide key flowsheet development data to evaluate SBW glass formulation work and support the SBW direct vitrification roadmap.

- Alternative Air Filtration Technology/ SRS Regenerable High Efficiency Particulate Air (HEPA) Filter System for Tanks (A9171). Two commercial firms under contract to NETL, the Mott and CeraMem Corporations, are developing conceptual designs for regenerable HEPA filter systems. In parallel with the design effort, the proposed ceramic and metal filter media are being tested to support a final down-selection decision. The schedule has been extended to allow for the vendors to provide a best and final alternative filter for testing at the ORR Filter Test Facility and simulant testing at the Savannah River Technology Center (SRTC). The final award for full system development will likely be completed late in September or early October 2001.

- Waste Mixing and Retrieval/Russian PMP (A9359). ORR selected a Russian PMP technology to retrieve remaining wastes within a GAAT tank and demonstrate the technology's performance. In January 2001, the Russian PMP was deployed to pump out ORR Tank TH-4. The PMP performance will be assessed to provide information to other sites as to the potential deployment capability for larger tanks at Hanford and SRS. In January 2001, at the request of the Hanford Single-Shell Tank (SST) Closure Project manager, a teleconference among of TFA, ORR, and Hanford Site representatives took place to discuss the possible use of the Russian PMP to aid retrieval of waste from SSTs. ORR is preparing an information package to facilitate a detailed evaluation for potential Hanford deployment. The package will include cold test results, quality assurance documentation, assembly drawings, and video test records from Russia.

3.0 Results of the Review

Conducting the Midyear Review in two phases allows the TFA to focus appropriate review resources on specific portions of the technical program to maximize the benefit from review activities. Results of the Midyear Review are summarized below.

3.1 Multiyear Technical Response Review

The initial phase of the Midyear Review, the MYTR Review, addressed key issues in TFA's current and outyear technical strategy. The following points summarize the outcome of this review:

- technical approaches were generally sound, and
- additional effort by the sites to fully explain issues and potential benefits within their needs statements and in discussions with TFA staff will lead to more robust technical responses.

Appendix D contains the specific user comments and recommendations on TFA's FY 2002-2004 MYTRs and the TFA response.

3.2 Midyear Review Meeting

The second phase of the Midyear Review, the Midyear Review Meeting, included strong participation of site user organizations that provided important information regarding programmatic and technical changes at their sites, and the current emphases in their site baselines. The PIs presented the projects selected for technical and status reviews. The TFA Management Team, the USG, the TAG, and the Technical Team conducted the reviews.

The following subsections provide summaries of the projects presented and reviewed at the Midyear Review Meeting, along with recommendations and TFA responses. Specific TAG and user comments and recommendations and the TFA response are contained in Appendix F. A summary of the actions coming out of this review is presented in Appendix G.

A final outcome of the Midyear Review includes the project maturity determination and gate/peer review evidence required to comply with OSTs review guidance. To provide this information, TFA prepared checklists for currently funded projects that have been active for at least 3 months. These checklists can be viewed at TFA's website at *http://www.pnl.gov/tfa/documents/FY01checklist/index.stm*.

3.2.1 Technical Reviews

Technical reviews were conducted on seven TFA projects. These detailed reviews focused on project relevance to user needs, technical merit and cost effectiveness, ES&H risks, and the viability of delivering the technical solution. The TAG served in a review capacity, with the users participating as appropriate (i.e., project-specific review criteria were used and written comments and recommendations were required).

The following subsections provide brief summaries of each project presented, the TAG and user comments and recommendations, and the TFA responses. Specific TAG and user comments and recommendations and the TFA responses are contained in Appendix F. A summary of the actions resulting from the Midyear Review Meeting is provided in Appendix G. Full descriptions of the projects can be found in the associated MYTR on TFA's web site at: *http://www.pnl.gov/tfa/program/fy01techresp/index.stm.*

3.2.1.1 (A9175) Tank Integrity Inspection Techniques – Center for Nondestructive Evaluation (CNDE) Requirements Strategy and Evaluation

TFA has received similar technology needs from Hanford, INEEL, SRS, and ORR requesting technologies to perform inspection of waste tanks. In response to these needs, TFA is implementing a technical strategy to perform an integrated assessment of specific site requirements and applications to further refine the technology needs and identify potential technologies that could address those needs. The objective is to identify shared technology opportunities and discriminate site-specific challenges to support detailed planning of appropriate technical development approaches. TFA is seeking to maximize the benefit of this work by leveraging common investments to support multiple sites wherever possible.

TFA and CMST are drawing on the expertise of the CNDE to assist in coordinating the review of site needs and requirements and to provide expertise in defining a strategy for selection and development of technologies to address those needs. A series of meetings with representatives of each user organization was conducted and the results are being documented by the CNDE. TFA is now developing the detailed planning to support executing specific technical scope in response to this technology needs assessment.

Review Comments/Recommendations

The TAG recommended that the TFA consider (1) developing risk-based methodologies to assess continued operations of tanks and pipelines with potential or existing defects, (2) conducting a risk-based assessment of the degree of examination of tanks needed to determine integrity status, and (3) membership in CNDE to facilitate interactions with industry and capitalizing on the substantial work done by industry in this area.

Based on user comments/recommendations, the project is progressing consistent with user needs, schedules, and readiness and commitment to deploy.

TFA Response

TFA concurs with the TAG's recommendations and will incorporate them into its future plans for this project.

3.2.1.2 (A9352) Remote Systems for Pit Operations and Maintenance - Hanford Pit Operations Enhancements

Waste retrieved from Hanford Site tanks must pass through a number of tank valve and pump pits before delivery to the waste treatment plant. Many of these pits will have to be decontaminated and equipment modified before the waste can be transferred. Current methods for modifying, operating, cleaning and decontaminating these pits are personnel intensive, costly, and result in a high dose to workers. Currently, work associated with pits is the single largest contribution to the River Protection Project (RPP) operations dose levels. For example, in support of recent Tank C-106 retrieval preparations, the initial dose rate measured in the C-106 tank valve pits was 40 Rad/hr. Traditional pit operations conducted manually by operations personnel are very slow and greatly constrained by limitations imposed by access, shielding, and viewing restrictions. In the case of C-106, after investing $2 million and 9 months of extensive manual operations, the dose rate was reduced to only 20 Rad/hr. During this campaign, 25 person-rem of dose to operations personnel was accumulated.

The technical strategy for improved remote decontamination, maintenance, and reconfiguration of valve pits evolves from the current Hanford baseline method, which is simple but difficult to use in higher radiation level cases. The objective is to determine what remote technology would be useful to the operating crews without requiring excessive upkeep over time. The technology insertion must be in small well-defined steps in order to be successful. Robotics will work closely with site operations personnel to define requirements, to develop specifications for procurement from industry, and to support eventual deployment of the system at Hanford.

At Hanford, the pit maintenance work was started in FY 1999 with the Robotics Crosscutting Program (Robotics) evaluating a number of technical options and recommending a fairly simple technical approach. The RPP ultimately agreed upon this approach during the first quarter of FY 2000, and site funds are being utilized to support the effort, as well as TFA funding. TFA, RPP, and cognizant DOE offices approved a Memorandum of Agreement (MOA), which provides that Hanford tank farm operations will supply operators and fund tank farm preparations and deployment through the W314 Project. In FY 2000, two procurements were placed for the deployment platform and manipulator arm. The deployment platform utilizes a commercial backhoe that will be used for gross positioning of the manipulator arm. The manipulator will be used to grasp and position tooling to perform remote operations within the pit. A camera system will provide the operator with viewing capability to support positioning and remote operations. Computer-based modeling and simulation is being done to assist in planning for system integration and testing, as well as to support planning for actual operations.

PI's from RPP, Pacific Northwest National Laboratory (PNNL), and Oak Ridge National Laboratory (ORNL) are collaborating in the development and testing of this system. ORNL is responsible for development of the viewing system. PNNL is responsible for specification and acquisition of the deployment platform and manipulator, system integration and testing,

and assisting RPP in training and field operations. RPP is responsible for defining system requirements, providing technical oversight, and integrating planning with the W314 project for system deployment.

Review Comments/Recommendations

The TAG recommended the TFA (1) revisit the project a year following the deployment to assess the degree of user reliance, (2) ensure sufficient cold-testing for full confidence in all systems and procedures, and (3) consider additional investments in conjunction with the decontamination and dismantlement automation activities of the Deactivation and Decommissioning Focus Area (DDFA) to extend productivity and operational safety.

Based on user comments/recommendations, the project is developing/progressing consistent with user needs, schedules, and readiness and commitment to deploy.

TFA Response

TFA concurs with the TAG's recommendations and will incorporate them into its future plans for this project. In addition, the TFA has identified this project as a candidate for pilot implementation of the OST TSDS evaluation that will be conducted in conjunction with the IUOE. Results of the TSDS evaluation will be made available to the project team and site user.

3.2.1.3 (A9508) Decontamination Process Waste Volume Reduction

The DOE-Idaho Operations Office (DOE-ID) and the State of Idaho have entered into an agreement to cease use of high-level liquid waste storage tanks at the Idaho Nuclear Technology and Engineering Center (INTEC) by 2012. In response, DOE-ID has established goals to cease liquid additions by ~2005 and, as a precursor to closing the tanks, is requiring INTEC to minimize the volume of wastes going to the tanks. A significant volume of newly generated waste is produced by decontamination processes, laboratory chemical analysis, and from treating spent HEPA filters. INEEL initiated investigation of commercial processes to reduce waste generation, and in FY 2000 TFA funded efforts to develop/utilize processes that reduce the volume of waste generation. The basic approach is to utilize more efficient decontamination technologies and alternative operating techniques to reduce wastes from analytical laboratories and filter treatment facilities.

Commercially available industrial and laboratory scale processes that generate significantly less quantities of waste, yet fulfill operational requirements are being investigated as replacement methods to those currently used. Industrial vendors are being interviewed for the capabilities they may be able to offer. Demonstrations of technologies will be applied to actual wastes on-site. Alternative operating techniques will also be investigated. In FY 2001, the project will complete identification and evaluation of industrial capabilities and technologies for decontamination of process equipment and tanks with minimal waste volume generation. The project will recommend technologies for further testing and development.

A new decontamination method, the Siemen's HP/CORD low waste process is being tested and evaluated. In FY 2001, the project will conduct a radioactive demonstration of the HP/CORD decontamination process on INTEC equipment components. Depending on results from this demonstration, specifications for new equipment for the FY 2002 planned deployment will be prepared.

New decontamination methods from Russia are being evaluated under a contract with the Bochvar Institute in Moscow. Included are a novel strippable coating and an electrochemical technique coupled with an ion exchange system to minimize liquid waste volume. In FY 2001, the project will complete evaluation of Russian decontamination methods.

Two technologies to minimize waste from treating HEPA filters are being tested: (1) a new, non-liquid technique for direct stabilization of the HEPA filter media, and (2) further modification of the current filter leach process (pulp processing) to be more efficient with respect to liquid waste generation. In FY 2001, work will continue with Argonne National Laboratories-West to investigate alternative methods for HEPA filter stabilization, including direct vitrification and other chemical stabilization methods. The project will provide information and recommend selection of alternative process(es) for spent HEPA filter processing.

Review Comments/Recommendations

Given the level of information presented by the PI at the Midyear Review, the TAG recommended the TFA conduct a follow-up review to ensure the project is progressing consistent with TFA and user needs and expectations. A number of specific technical issues regarding the work performed to date were raised and are described in Appendix F. The follow-up review should evaluate the experimental planning documents; past experimental methods, data, results, and conclusions; the technical experience and expertise of experimenters; and the future direction.

Based on user comments/recommendations, the project is a very high priority and appears to be progressing consistent with user needs, schedules, and readiness and commitment to deploy. The end user believes this work, which is primarily funded by the site, is demonstrating useful results that can significantly improve current processes.

TFA Response

The TFA concurs with the TAG's recommendations and is working with the site user to plan and schedule this follow-up review. INEEL has conducted an internal review of this project based on the TAG recommendation. Results of this review and a specific response will be provided to the TFA for evaluation and planning further actions as needed.

3.2.1.4 (A9768a) Specify and Enhance Design of HLW Glass Melters - INEEL Melter Development

INEEL is in the early stages of investigating vitrification as the baseline treatment method for both liquid SBW and dry calcine waste. DOE-ID has an agreement with the State of Idaho that specifies dates which drive the treatment schedule for these waste streams. By 2012, the remaining liquids in the INTEC waste tanks must be removed, which drives the treatment schedule for SBW. By 2035, all waste must be road-ready, which drives the treatment schedule for the calcine waste. DOE-ID expects to recommend vitrification treatment of both waste streams as the preferred treatment method in an upcoming record of decision.

TFA is funding development and testing work to support recommendations on melter technology appropriate for treating the SBW and calcine. Melter tests with INEEL simulated feeds will be performed to develop operating limits on salt and rare earth species to resolve phase stability and melt rate concerns under continuous operations. Criteria transferring INEEL feed to a melter and for melter performance (corrosion, melt rate, etc.) will be developed. Higher temperature melts, possibly up to 1500°C, will be evaluated with particular emphasis on volatility. Testing of glasses formulated for higher temperature melters will be arranged with particular attention toward coordination with strategic task AA7S2, New Melter Technology.

SRTC will provide technical staff to support continuous operation of the melters to accomplish the test objectives in this task. Where possible, cognizant staff involved in the program and trained on the equipment will supplement the SRTC technical support (e.g. INEEL, Florida International University [FIU], and PNNL PI's). Test or experimental plans will be prepared (by INEEL) for each melter run and reviewed by the non-lead members of the SRTC technical team.

For application to INTEC waste streams, the glass chemistry work in TFA MYTR A9773, Improve Waste Loading in High Level Waste Glass, will be integrated with this task to ensure materials compatibility and to define performance requirements. INEEL has done extensive work on evaporation of various combinations of INTEC waste streams and a combination of literature, national, international, and on-going research (e.g. flowsheet development for Hanford) will be leveraged to address this user need. Similarly, previous work has been performed by PNNL and INEEL in FY 1998 on technical options for denitration of INEEL waste streams, which is applicable to this task. Functional tests of proposed INEEL melter feeds will be conducted, including feed handling, pilot scale melting and offgas characterization. The initial INEEL work will focus on gaining experience with the individual calcines and SBW and identifying processing issues associated with zirconium, phosphate, and nitrate levels.

Review Comments/Recommendations

The TAG recommended the TFA develop a strategy for evaluation of INEEL melter technology options, define a set of preliminary melting process requirements and melter capabilities for each potential INEEL waste feed option, define glass property characteristics/requirements that would

match up with various candidate melter technologies under evaluation and determine compatibility with viable formulations and optimized waste loadings, and engage both PNNL and SRTC staff who have performed radioactive waste vitrification studies in hot cells to assist planning scheduled work with actual SBW samples.

Based on user comments/recommendations, the project is developing/progressing consistent with user needs, schedules, and readiness and commitment to deploy.

TFA Response

TFA concurs with the TAG's recommendations. In fact, several recommendations are already in the process of being implemented (melting process requirements and glass property requirements). Remaining recommendations will be incorporated into future plans for this project.

3.2.1.5 (A9768b) Specify and Enhance Design of HLW Glass Melters - SRS Melter Improvements

The SRS Defense Waste Processing Facility (DWPF) has been operating for a number of years and in that time, opportunities to improve the vitrification process design and the glass melter design have been identified. Changes to the configuration of the melter pour spout are required to stabilize glass-pouring behavior. There is a need to prevent a phenomenon called "wicking" (where the glass adheres to the wall of the pour spout rather than dropping directly into the canister) and to accommodate changes in glass flow resulting from spout wear. This has resulted in significant pluggage of the pour spout and lower glass production rates versus design. Current work is focused on the DWPF pouring issues related to pour spout configuration (knife edges, heater locations, temperature, etc.). In addition to design modifications, changes in feed conditioning may also contribute to improvements in pouring, since there is evidence that the current melt is aggressive to the pour spout materials of construction.

Design changes have been proposed to improve the design of the DWPF melter pour spout. In addition to physical design changes, modifications to materials of construction will also be evaluated to reduce the impact of corrosion/erosion. Candidates for both the pour spout and the insert include coatings and material changes, such as platinum and ceramics. Material modifications are currently being made to the bellows liner to reduce the tendency for the glass to collect in that area. The plan is to continue utilizing both the FIU small melter (designed to understand flow dynamics) and the Clemson University large-scale melter facilities to test actual design options (including inserts and configurations for next generation melters). The impact of the Argon purge will be evaluated (it is currently not functional in the DWPF melter-1).

Limited hot testing of one design modification to the pour spout was tested in DWPF in FY 2000 and performance issues were encountered. Lessons learned are being evaluated and incorporated into continued development and testing. Results of these tests indicated further work and refinement of the modifications would be required for improved operation.

Review Comments/Recommendations

The TAG recommended that the TFA complete and close the current University work performed in conjunction with the program, ensuring the results of the work are documented. In addition, the TFA should consider (1) advanced imaging systems for future melter pour spout tests and evaluations prior to incorporating them into the DWPF melter design, and (2) other melter configurations (i.e., a flooded pour spout configuration or a horizontal extension of the riser).

Based on user comments/recommendations, the project is developing/progressing consistent with user needs, schedules, and readiness and commitment to deploy. The user indicated that the work will lead to a better design of pour spout/pour spout inserts and provide the user with technology to systemize pour spout geometry.

TFA Response

The TFA concurs with the TAG's recommendations and will factor them into the future planning for the project. Completion and closeout of several tasks will be addressed in the remainder of FY 2001 scope and planning for FY 2002.

3.2.1.6 (A9777) Remote Disassembly of HLW Melters and Other Processing Equipment - Melter Glass Removal Methods and Dismantlement of Failed Vitrification Equipment

This project addresses the need to size reduce, decontaminate, classify, and dispose of large, failed, highly contaminated processing equipment including HLW melters, processing vessels, jumpers, etc.

The approach will be to develop techniques that are compatible with remote operations either in a large shielded cell or in a portion of a "canyon" building monitored by video. The first task will be to demonstrate techniques suitable for removing HLW glass from a failed melter, compatible with either recycling into a process step or, if glass can be shown to be acceptable, loaded directly into a HLW canister which could either be welded closed or further filled with molten glass. Since glass has been removed from test and radioactive melters, technology used for those tasks will be evaluated for applicability or adaptation to remote operations. A strategy for segregating/removing glass in the melter and sampling and analysis will be developed to support disposal as HLW either directly into canisters or via reprocessing through another melter. The recommended process will be demonstrated on a non-radioactive, pilot-scale or full-scale melter. From that demonstration, recommended specifications for systems to be used at HLW processing facilities will be prepared. A plan will be developed to identify the paths for disposal for all of the waste resulting from glass removal, cutting and size reduction activities.

The second task is to determine the technical, operational, and regulatory requirements for size reduction, decontamination, sorting, and disposal of failed process equipment and process vessels. Once the approach and equipment have been identified, a demonstration of the technologies will be performed. Recommended specifications for systems to be used at HLW processing facilities will be prepared. This second task also benefits from experience and lessons learned from the ongoing deployment of technologies under the Vitrification Expended Material Processing (VEMP) System (Accelerated Site Technology Deployment [ASTD] funded project), which is being used to segregate, size reduce, and package various materials and equipment generated during the vitrification of HLW at the WVDP.

This project is being performed collaboratively by WVDP, SRTC, and ORNL. The project is funded through TFA in collaboration with Robotics. WVDP has the overall lead for the project, as well as the lead for the size reduction task and integration with the VEMP project. SRTC has the lead for the glass removal methods task. Robotics program expertise from ORNL is being applied to select and specify equipment and to apply expertise from other remote decontamination and decommissioning (D&D) projects.

Review Comments/Recommendations

The TAG recommended the TFA

- factor into its planning Hanford's Waste Treatment and Immobilization Plant needs and planning for disassembly and disposal of melters,

- coordinate an evaluation of regulatory drivers and costs associated with final disposal of HLW melter equipment and scrap glass,
- expand the glass removal development activity to include exploration and development of more innovative solutions,
- expand the scope or initiate a new task to address glass removal as a means of extending melter life when processing high noble metals feeds, and
- promote a reassessment at DWPF of the feasibility of vacuum extraction of molten glass from the melter as a basis for disposal enhancement or noble metals remediation.

Based on user comments/recommendations, the project is developing/progressing consistent with user needs, schedules, and readiness and commitment to deploy.

TFA Response

TFA concurs in general with the TAG's recommendations and will consider them in future planning for the project and/or in opportunities to leverage off of other work (i.e., ASTD) being done or to be done. The TFA will consider these recommendations in the review of the proposed scope defined in the FY 2002 development plan for this project.

3.2.2 Status Reviews

Status reviews were conducted on twenty-four TFA projects. These reviews focused on project plans, progress, or lessons learned and opportunities for transferring technology and experience to other sites or applications, depending on the stage of the project. The TAG and the users, as appropriate, participated in these reviews in an advisory capacity (i.e., general review criteria were used and written comments and recommendations were encouraged but not required).

The key outcomes of the reviews are summarized below.

- The lessons learned and opportunities for technology and experience transfer to other sites are relevant and invaluable to other projects and should be documented and communicated.

- The point in the project at which the TFA should no longer participate, and the transition that needs to take place, should be identified and documented by the TFA (e.g., the "TFA exit

The specific TAG and user comments and recommendations followed by the TFA responses are contained in Appendix F. A summary of the actions resulting from the Midyear Review Meeting is provided in Appendix G. Descriptions of the projects can be found in the associated MYTR at TFA's web site: *http://www.pnl.gov/program/fy01techresp/index.stm.*

3.2.3 EMSP Reviews

Twelve EMSP projects received a status review focused on increasing the relevance of research and the associations/interactions with the problem holders – the TFA and the site users. The TAG and the users, as appropriate, participated in these reviews in an advisory capacity (i.e., review criteria were not used and written comments and suggestions were not required but welcomed). The key outcomes of the EMSP project reviews are summarized below.

- The projects are conducting research and development that is directly relevant to and well connected with the TFA projects. TFA should identify and communicate the key factors contributing to the success of these projects in accomplishing these objectives (relevancy and connection to users).

- TFA's Technology Integration Managers (TIMs) are playing a key role in facilitating the relevancy of and the interactions between the EMSP projects and TFA and the TFA should ensure their continued involvement along these lines.

The specific TAG and user comments and suggestions and the TFA responses are contained in Appendix F. A summary of the actions resulting from the Midyear Review Meeting is provided in Appendix G. Abstracts of these projects can be found at the EMSP web site at: *http://emsp.em.doe.gov*.

4.0 References

PNNL-13339, “Multiyear Program Plan FY01-05”, September 2000.

Appendix A – TFA Review Strategy

The Department of Energy's (DOE) Office of Science and Technology (OST) has provided the Focus Areas with general guidance on planning and conducting technical reviews. The Tanks Focus Area (TFA) has developed a specific strategy for conducting a variety of technical reviews of new and ongoing projects that is consistent with the program's specific needs for monitoring technical progress and with OST guidelines. Technical reviews are an important element of the TFA review strategy. The overall goal of these reviews is to help ensure that TFA projects, and ultimately the overall program, deliver technical solutions that will successfully meet the needs of the user. Many of these reviews are independent in that they are conducted by experts that do not have a participating role or organizational interest in the activity undergoing review.

The key types of technical reviews conducted under the TFA Program include:

- Independent reviews
- Technical progress reviews
- Project Maturity Status Determination checklist (i.e., Gate) reviews
- Midyear reviews
- Proposal reviews
- Ad hoc or externally requested technical assistance/reviews

The TFA has a variety of technical expert and user groups at its disposal from which to draw upon on when planning reviews:

- Technical Advisory Group (TAG)
- Technology Integration Managers (TIMs)
- User Steering Group (USG)
- Site Representatives and other site users
- Technical Team
- American Society of Mechanical Engineers (ASME)
- Subject Matter Experts (SME)

A.1 Independent Reviews

Independent reviews focus on technical feasibility/validity and relevancy in meeting the needs of users and the TFA. These reviews are typically conducted on "new starts" or projects in the early stages of the technology maturity cycle. Two types of independent technical reviews are conducted – ASME Peer Reviews as defined under OST guidelines, and reviews conducted by the TFA TAG. Reviews of proposals, new starts, and ongoing projects that meet certain requirements are performed by relevant experts selected by ASME. Projects nearing deployment where the end user will make decisions on technology acceptance and deployment are not considered for ASME Peer Review. Specific requirements and criteria for conducting these ASME Peer reviews are provided in

procedures developed for OST by the Institute for Regulatory Science.[a] ASME reviews and recommendations are documented in a formal report to the Focus Area Program Manager (DOE-HQ). TAG reviews are conducted on new starts and projects where ASME reviews do not apply. These reviews are then documented in a letter report to the TFA Program Lead (DOE Richland Operations Office [DOE-RL]).

A.2 Technical Progress Reviews

Technical progress reviews focus on technical feasibility/validity and assess the progress of the work according to the defined technical objectives. These reviews are typically conducted on ongoing projects that are approaching major decision points, such as decisions to proceed with major equipment investments or "hot operations"; for projects experiencing programmatic issues such as a loss of co-funding by the user; and for periodic assessment of activities in the mid to late stages of the technology maturity cycle. Technical progress reviews are performed by the TFA's TAG, TIMs, users, Technical Team, or SMEs, depending on the stage of the project and complexity of the technical area under review. Often, a review team comprised of representatives from several of these technical expert and end user groups is convened, depending on the objectives of the review. Results of these reviews are generally documented in a letter report provided to the TFA Program Lead.

A.3 Project Maturity Status Determination (i.e., Gate) Checklist Reviews

Project Maturity Status Determination or Gate checklist reviews focus on the technology maturity stage of the project. This type of review is required in advance of a project's transition into certain gates - Gate 2 (Development) and Gate 5 (Demonstration). These reviews are conducted by a team comprised of representatives from TFA's Technical Team, TIMs, TAG, and users as appropriate. A gate review checklist is developed by the Technical Team and TIMs and used to facilitate and document the results of the review. A gate review report in letter report format, including the completed checklist, is provided to the TFA Program Lead.

A.4 Midyear Reviews

Midyear reviews focus on the status or technical performance of ongoing projects. Depending on the stage of the project, status reviews focus on project plans, progress, or lessons learned, and opportunities for transfer of technology and experience to other sites or applications. Technical reviews focus on: project relevance to user needs; technical merit and cost effectiveness of the project; environmental, safety and health risks; and viability of delivering the technical solution, including user readiness and commitment. These reviews are typically conducted by the TFA Technical Team, TAG, users, and DOE Management Team around the midpoint of the fiscal year. SME reviewers may also be involved in the reviews to address a specific aspect of a project. Specific guidance provided by OST is used in planning for the midyear review and includes completion of project maturity checklists for all active, ongoing projects. An additional business review of project deliverables and fiscal

(a) As described in the *Handbook of Peer Review, November 1999.*

performance are also included in the midyear review process. Review of program planning, including review of the Multiyear Technical Responses (MYTRs) for out-years is also included in the midyear review process. The midyear review activity may span several months and include a composite of separate activities that are documented in a midyear review report.

A.5 Proposal Reviews

The key areas of focus in proposal reviews are on technical feasibility/validity and user and program relevancy. These technical reviews are generally conducted on proposals received in response to "calls" or requests for proposals generated by the TFA. Review teams comprised of representatives from the TAG, Technical Team, and TIMs are assembled. In addition, proposals meeting requirements for ASME reviews are reviewed by relevant experts from ASME. ASME reviews and their recommendations are documented in reports and considered in the proposal evaluations. Technical review recommendations are sent to the TFA Program Lead, who combines them with the DOE assessment of the business portion of the proposals and then makes the ultimate project selection.

A.6 Ad Hoc or Externally Requested Technical Assistance/Reviews

Because of its network of technical experts, the TFA is often requested by the sites (DOE Field Offices, DOE-Headquarters (HQ), and contractor organizations) to provide technical assistance/reviews. The primary focus is on providing an independent technical opinion or assessment. Typically, a team of technical experts comprised of representatives from the various technical expert groups (i.e., TAG, TIMs, users, etc.) and other broadly selected technical experts (depending on the needs and objectives of the site, is assembled by the TFA Technical Team. Examples include the technical assistance and reviews by TFA for DOE-Idaho Operations Office (DOE-ID) on selected technologies being considered under the Environmental Impact Statement (EIS) process for the treatment of liquid tank waste and calcine, and the technical review of the final design documents for the retrieval systems for DOE Fernald's Accelerated Waste Retrieval Project (AWR). Specific reporting formats and products are negotiated with the requesting organization and include a range of documents such as letter reports or more detailed published technical reports.

A.7 Review Strategy and Process

The TFA's framework or strategy for planning, conducting, and documenting technical reviews is reflected in Table A.1. Each year, the TFA review process starts with an initial assessment of the review needs for existing and new projects. This initial assessment occurs at the MYTR stage and is used to determine the overall review approach/strategy for the project, including the type of review(s) that will be needed. Reviews anticipated as a result of this initial assessment are highlighted in the technical response. After finalization of technical responses and during development of the program execution guidance (PEG), a second, more detailed assessment is performed to determine the specific review(s) to be conducted in the coming year and the best timing for the review(s). Specifying the review(s) in the PEG helps ensure the review is planned and funded.

Once the reviews for all of the projects have been identified, a review schedule for the coming year is prepared by the TFA. This plan and schedule spells out, for each project/review, the proposed review schedule and logistics, review objectives and criteria, review team, and review materials and documentation. The schedule is then used to prepare and conduct the reviews.

Following each review, a review report is prepared. The report describes the review and outlines observations and recommendations. Responses to the recommendations are then prepared, distributed, and tracked to completion.

Table A.1. TFA Review Strategy

Review Drivers/ Requirements	Review Objectives	Review Timing/ Scheduling	Type of Review	Candidate Reviewers	Review Materials	Review Products/ Documentation
• New work - Newly Proposed Projects - Competing Proposals	• Technical Feasibility/Validity • User Need • Program Relevancy	• Technology Maturity Stages 0-4/5	• Independent Reviews	• ASME • TAG • Technical Team • TIMs • SMEs	• Statement of Work (SOW) • Review Criteria • MYTRs, PEGs, Technical Task Plans (TTPs) • Presentations • Request for Proposals • Proposals	• Review Reports
• Ongoing Projects with Major Decision Points or Major Technical or Performance Issues	• Technical Feasibility/Validity • User Need	• Various Technology Maturity Stages	• Technical Progress Reviews • Gate Reviews • Midyear Reviews	• TIMs • Users • Technical Team • SMEs • TAG	• Performance Reports • Planning Documents	• Letter Reports • Meeting Minutes
• Ongoing Projects - Every Three Years	• Status/Performance	• Various Technology Maturity Stages	• Gate Reviews • Midyear Reviews • Independent Reviews	• TIMs • TAG • Users • Technical Team • ASME	• Performance Reports • Technical Reports	• Review Reports • Gate Checklists • Midyear Checklists
• Ad hoc or Externally Requested Technical Assistance/Reviews	• Independent Technical Assessment	• Various Technology Maturity Stages	• Various (Depends on Requirements)	• Technical Team • TAG • TIMs • SMEs	• Various (Depends on Requirements)	• Published Reports • Letter Reports

Appendix B – TFA FY 01 Projects and Midyear Reviews

MYTR No.	FY01 MYTR Title	FY01 Project Title	Type of Midyear Review			
			Midyear - MYTR	Midyear – Technical	Midyear - Status	Project Maturity
A9143	HLW Tank Corrosion Control and Monitoring	Hanford EN Corrosion Monitoring	**X**		**X**	**X**
A9143	HLW Tank Corrosion Control and Monitoring	ORNL SST Corrosion Monitoring	**X**			**X**
A9143	HLW Tank Corrosion Control and Monitoring	SRS EIC/EN Corrosion Monitoring	**X**		**X**	**X**
A9157	Tank Leak Mitigation	Tank Leak Mitigation	**X**		**X**	**X**
A9171	Alternative Air Filtration Technology	Alternative Filtration Technologies for SRS Tanks	**X**			**X**
A9171	Alternative Air Filtration Technology	Alternative Filtration Technologies for Calcine Transfer	**X**			**X**
A9175	Tank Integrity Inspection Techniques	CNDE Requirements Evaluation	**X**	**X**		**X**
A9175	Tank Integrity Inspection Techniques	Hanford Tank Integrity Inspection	**X**			**X**
A9175	Tank Integrity Inspection Techniques	SRS Tank Integrity Inspection and Repair	**X**			**X**
A9175	Tank Integrity Inspection Techniques	WV Interim Tank Storage Configuration Evaluation	X			**X**
A9246	Waste Sampling and At-Tank Analysis	Fluidic Sampler (Hanford)	**X**			X
A9278	Slurry Transfer and Tank Waste Mixing Monitors	Dual Coriolis Slurry Monitoring	**X**		**X**	**X**
A9352	Remote Systems for Pit Operations and Maintenance	Hanford Pit Operations Enhancements	**X**	**X**		**X**
A9352	Remote Systems for Pit Operations and Maintenance	SRS Pit Operations Enhancements	**X**			**X**
A9359	Waste Mixing and Retrieval	SRS/Hanford Mixer Pump Operational Improvements	**X**			**X**
A9361	Heel Retrieval from Obstructed Tanks	WV Tank Heel Sampler	**X**			**X**
A9361	Heel Retrieval from Obstructed Tanks	INEEL Tank Heel Retrieval	**X**		**X**	**X**

MYTR No.	FY01 MYTR Title	FY01 Project Title	Type of Midyear Review			
			Midyear - MYTR	Midyear – Technical	Midyear - Status	Project Maturity
A9362	Salt Cake Dissolution Retrieval	Salt Cake Dissolution Retrieval	**X**		**X**	X
A9363	Chemical Cleaning of Tanks	SRS Chemical Cleaning	**X**			**X**
A9363	Chemical Cleaning of Tanks	INEEL Chemical Cleaning	**X**			**X**
A9367	Unobstructed Tank Heel Retrieval	SRS Disposable Crawler	**X**		**X**	**X**
A9367	Unobstructed Tank Heel Retrieval	Hanford SST Retrieval	**X**		**X**	**X**
A9376	Waste Transfer Line Plugging Prevention and Unplugging Methods	Waste Transfer Line Plugging Prevention and Unplugging Methods	**X**		**X**	**X**
A9501	INEEL Integrated Radionuclide Separations Process	Russian Universal Solvent Extraction	**X**			**X**
A9508	Decon Process Waste Volume Reduction	Decontamination Methods Development	**X**	**X**		**X**
A9554	Hanford Tank Waste Chemistry	Hanford Waste Transfer/Solids Formation	**X**		**X**	**X**
A9554	Hanford Tank Waste Chemistry	Saltcake Dissolution	**X**		**X**	**X**
A9554	Hanford Tank Waste Chemistry	SRS 2H Evaporator Chemistry	**X**		**X**	**X**
A9555	Sludge Washing and Dissolution	SRS Sludge Processing	**X**			**X**
A9555	Sludge Washing and Dissolution	Hanford Sludge Washing and Dissolution	X			**X**
A9570	Salt Disposition	SRS Salt Processing Project - TPB	**X**		**X**	**X**
A9570	Salt Disposition	SRS Salt Processing Project - CST	**X**		**X**	**X**
A9570	Salt Disposition	SRS Salt Processing Project - MST	**X**		**X**	**X**
A9570	Salt Disposition	SRS Salt Processing Project - Solvent Extraction	**X**		**X**	X
A9584	Calcine Separations	Calcine Dissolution	**X**			**X**

MYTR No.	FY01 MYTR Title	FY01 Project Title	Type of Midyear Review			
			Midyear - MYTR	Midyear – Technical	Midyear - Status	Project Maturity
A9586	CIF Evaporator	Waste Water Triad	X		X	X
A9709	Waste Treatment Process Flowsheet Model	Waste Treatment Process Flowsheet Model	X			X
A9719	Conditioning and Immobilization of Low-Activity Waste	INEEL LLW Cementation/Disposal	X			X
A9748	Testing and Prediction of Long-term Waste Glass Performance	Testing and Prediction of Long-term Glass Performance	X			X
A9768	Specify and Enhance Design of HLW Glass Melters	SRS (DWPF) Melter Improvements	X	X		X
A9768	Specify and Enhance Design of HLW Glass Melters	INEEL Melter Development	X	X		X
A9768	Specify and Enhance Design of HLW Glass Melters	Next Generation Melter Development	X			X
A9773	Improve Waste Loading in HLW Glass	Improved HLW Glass Loading	X			X
A9773	Improve Waste Loading in HLW Glass	INEEL Glass Formulations Development	X		X	X
A9777	Remote Disassembly of HLW Melters and Other Processing Equipment	WV Vitrification Expended Materials (ASTD)	X		X	X
A9777	Remote Disassembly of HLW Melters and Other Processing Equipment	Melter Glass Removal Methods	X	X		X
A9777	Remote Disassembly of HLW Melters and Other Processing Equipment	Dismantlement of Failed Vitrification Equipment	X	X		X
A9923	Enhanced Grout Formulations for Tank Closure	Enhanced Grout Formulations for Tank Closure	X			X
AA1S1	Pre-Closure Interim Tank Maintenance	Pre-Closure Interim Tank Maintenance	X		X	X
AA202	In-Situ Waste Characterization	WV In-tank Radiological Measurement Methods	X			X

MYTR No.	FY01 MYTR Title	FY01 Project Title	Type of Midyear Review			
			Midyear - MYTR	Midyear – Technical	Midyear - Status	Project Maturity
AA203	Residual Waste Sampling	Sampler for INEEL	**X**			**X**
AA3S1	Selective Chemical Dissolution of Tank Heels to Improve Retrieval	Selective Chemical Dissolution of Tank Heels to Improve Retrieval	**X**		**X**	X
AA3S2	SST Retrieval from Potential Leaking Tanks	SST Retrieval from Potential Leaking Tanks	**X**		**X**	**X**
AA5S1	Removal of Key Non-Radioactive Elements from Tank Waste	Removal of Key Non-Radioactive Elements from Tank Waste	X		**X**	**X**
AA7S2	New Melter Technology	New Melter Technology	**X**		X	**X**

Appendix C – Review Panels

C. 1 Multiyear Technical Response Review

TFA Management Team
Kurt Gerdes, DOE Headquarters, EM-50
Ted Pietrok, DOE Richland Operations Office (DOE-RL)
Ken Picha, DOE Headquarters, EM-22
Joe Cruz, Site Representative, Hanford Site
John Drake, Site Representative, West Valley Demonstration Project
Tom Gutmann, Site Representative, DOE Savannah River Operations Office
Keith Lockie, Site Representative, DOE Idaho Operations Office
Jackie Noble-Dial, Site Representative, DOE Oak Ridge Operations Office

TFA User Steering Group
Fred Damerow, West Valley Nuclear Services, West Valley Demonstration Project
Ken Gasper, CH2M Hill Hanford Group, Hanford Site
Jerry Morin, Westinghouse Savannah River Company, Savannah River Site
Sharon Robinson, Oak Ridge National Laboratory, Oak Ridge Reservation
Jim Valentine, Bechtel BWXT Idaho, LLC, Idaho National Engineering and Environmental Laboratory
Rod Quinn, Pacific Northwest National Laboratory

C.2 Midyear Review Meeting

TFA Management Team
Kurt Gerdes, DOE Headquarters, EM-50
Ted Pietrok, DOE Richland Operations Office (DOE-RL)
Denis Koutsandreas, DOE Headquarters, EM-22 (for Ken Picha)
Joe Cruz, Site Representative, Hanford Site
John Drake, Site Representative, West Valley Demonstration Project
Tom Gutmann, Site Representative, DOE Savannah River Operations Office
Keith Lockie, Site Representative, DOE Idaho Operations Office
Jackie Noble-Dial, Site Representative, DOE Oak Ridge Operations Office

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Appendix D – Multiyear Technical Response (MYTR) Review Comments and TFA Responses

MYTR	Comments and Suggested Revisions	TFA Response
SAFETY		
B143	**HLW Tank Corrosion Control and Monitoring**	
CHG	Please insert the word "chemistry" on the first page under Summary of Need(s), first paragraph under HANFORD, third line between the words "provide" and "monitoring."	The MYTR text was modified as requested.
B144	**Tank Materials Properties**	
WPI	The need mentions studies and technology hardware to be created where the response deals with studies with no mention of designing hardware.	Four separate needs were identified in SR01-2035. This response deals just with the pipe inspection need. The equipment needs are addressed in MYTRs B157, B175, and B176.
B157	**Tank Leak Mitigation**	
INEEL	Revise INEEL portion of "Summary of Need(s)" as follows: 1. Revise 2nd sentence to read: *It is assumed that up to 15% of the approximately 700 targeted tanks may require…* 2. Add the following sentence immediately after the 2nd sentence: At least one tank at the Test Reactor Area facility is known to have the access port below the liquid level. 3. Add the following sentence just before the last sentence is the paragraph: *In addition, the Consent Order with the State of Idaho requires that the integrity of the tank not be compromised due to the addition of new access ports.* Revise INEEL portion of "Technical Approach" as follows: 1. Add the following 1st sentence: *In FY02 INEEL will establish F&DRs for a tank penetration and sealing system and begin evaluation of available technologies and systems.* 2. Revise the next sentence as follows: *During FY03, INEEL will procure a device…*	The MYTR text was modified as requested.
CHG	Increase emphasis on creating and then proof-of-principle testing of novel ideas. The selection of ex-tank material to reduce radionuclide transport needs to focus on critical radionuclides; apatite is good mostly for transuranic only.	The MYTR text was modified to reflect this comment.

MYTR	Comments and Suggested Revisions	TFA Response
B171	**Alternative Filter Technology**	
INEEL	Revise INEEL portion of "Technical Approach" as follows: 1. Revise the last sentence of 2nd paragraph as follows: *Therefore, site funding will most likely not be available to support work related to calcine retrieval in FY02 or FY03.* General comments: Activities related to design of the vitrification offgas system are considered high priority for the INEEL and will be strongly supported in FY02 and beyond. Any support in finalizing the offgas system configuration, including the applicability of cleanable HEPAs, is very important the HLW Program. Consequently, we would like to apply to entire $255K or an appropriate portion of it, to this activity, which will be co-funded at a comparable level. The INEEL will work closely with the Safety TIM to determine more definitive scope beyond what is currently identified in the MYTR.	The MYTR text was modified as requested. The general comment is noted. This MYTR focuses on development of cleanable filters for various air filtration needs across the DOE complex. Additional work to define the offgas treatment system for INEEL is covered in MYTR B722 HLW Process Offgas Treatment.
B175	**Tank Integrity Inspection Techniques**	
CHG	This tries to cover too many issues and sites. This should focus on DST integrity issues.	The TFA bins common site technology needs into single MYTRs to maximize the multi-site benefit and leverage the R&D investment.
CHG	The Need Section identified two SST needs (1-Concrete dome and wall inspection for structural integrity, and 2-Wall integrity of the carbon steel liner) and three DST needs (1-Remotely operated NDE equipment deployed through a 3" diameter riser, 2-Knuckle region inspection utilizing SAFT/TSAFT technology, and 3-NDE equipment that can inspect the tank wall beyond the vertical air ducts). The technical approach, however, only addresses SST need #2 and DST need #2. There are technical approaches that can address each of the needs and this response should be expanded to address each of them. Also, the Approach includes discussion of a "limited destructive evaluation, and repair system for SST," and there is no summary of this need or connection to Hanford.	All needs have been addressed in the technical approach. The "limited destructive evaluation, and repair system for SST," is in response to the need described in the second paragraph of the Hanford need summary, "If necessary, destructive metallurgical examination of small isolated sections of the SSTs may need to be performed to obtain a thorough understanding of the operating corrosion mechanisms."

MYTR	Comments and Suggested Revisions	TFA Response
INEEL	Revise INEEL portion of "Summary of Need(s)" as follows: 1. Revise the 2nd paragraph as follows: *Across the INEEL there is a pressing need for sampling, visual inspection, and real-time NDE data in remote and inaccessible spaces. Recent analysis of coupons in the INEEL tank farm indicated unexpected corrosion rates. There is a need to be able to quickly assess the integrity of the tanks to determine if corrosion issues are present. In addition, the State of Idaho is expecting NDE to be performed on the tanks as part of the closure activities. An NDE end-effector is needed for deployment on the LDUA that has the necessary resolution to meet the INEEL integrity inspection requirements.* 2. General comment: The State of Idaho is currently no longer requiring INEEL to perform visual inspection of the tank annulus areas (e.g. for closure of tanks WM-182 and WM-183). In addition, it is unclear if INEEL will be required to actually sample the sand pads; however, this is still under consideration. 3. Revise INEEL portion of "Technical Approach" as follows: Delete the entire paragraph and replace with the following: *During FY01 the INEEL worked on development of an NDE end-effector for the LDUA. It is planned to be deployed at the end of FY01 or during early FY02. However, this unit is capable of only above heel/liquid inspections. The INEEL would continue to refine the NDE end-effector such that it is submersible and can be deployed for inspection within the tank heel/liquid regions, which is the most likely location for corrosion. Design, fabrication, and cold demonstration would be accomplished in FY02. During FY03, cold application would be demonstrated through testing of the end-effector on the LDUA. A hot deployment would be planned for the end of FY03.* The "Key Products" section should be revised accordingly.	1. The MYTR text was modified as requested. 2. All references to annulus inspection requirements have been removed from the Technical Response and associated spreadsheet as have all reference to PE certification of any tanks at INEEL. 3. The intent of this comment has been incorporated into the response. However, the response has been expanded to include evaluation of the SAFT/TSAFT technology as an alternative to a submersible approach. Additionally, comment has been added on the aggressiveness of the proposed schedule.

MYTR	Comments and Suggested Revisions	TFA Response
INEEL	General comment: INEEL is not currently planning to certify any of the existing tanks. This change in program direction was not unexpected, which is why the original FY01 work was down-scoped from $285K to $85K. Initial investigations into certification were supported, but INEEL is currently in the process of re-evaluating the FY01 TTP scope and will pursue renegotiation with the TIM and TFA. A proposed revised budget spread sheet is as follows: FY02 FY03 6. INEEL Technology Support $400K $400K 6.1 Complete design of submersible NDE end-effector $175K 6.2 Procure materials and fabricate end-effector $150K 6.3 Complete cold demonstration $ 75K 6.4 Cold application on LDUA $100K 6.5 Hot deployment in tank farm $300K	General Response: Noted. The proposed budget has been revised to reflect the INTENT of the proposed changes. However, the numbers are not exactly the same.
WPI	Major Sections of the response are incomplete	The Technical Team and Sites have reviewed the MYTR and specific comments have been addressed.
B176	**Piping Integrity Inspection Techniques**	
ORR	We did not see a technical response on piping inspection/characterization. This is a potential need for closure of auxiliary pipes and other sites.	MYTR B176 addresses piping inspection in response to an SRS Need Statement. No need statement appeared to have been submitted by ORR.
WPI	The need states studies and technology hardware where the response explains that technology hardware will be provided, but does not define the studies needed – such as the Material Property Database.	Four separate needs were identified in SR01-2035. This response deals just with the pipe inspection need. The materials property database is addressed in MYTR B144.
B190	**Database for Tanks and Piping Configuration**	
INEEL	This is a low priority and will not be co-funded. The VCO Program will most likely remove this Site Technology Coordination Group (STCG) need statement. It has been identified as a "nice to have," but not an actual need.	The TFA will screen out this need and not prepare a formal response.
B1S1	**Pre-Closure Interim Tank Maintenance**	
INEEL	No comments. INEEL is seeking laboratory-directed research and development (LDRD) funding to begin efforts to address portions of this need in FY02.	No action required.
CHARACTERIZATION		
B201	**Sludge Mapping and Volume Estimates**	
ORR	ORR has equipment/experience in area. Hanford has expressed interest in our equipment and technical assistance for sludge mapping. TIM should investigate adding Hanford to the need, and providing funding for technical support from OR.	A Topographic Mapping System (TMS) system has been shipped from ORNL to Hanford and will be evaluated at Hanford with EM40 funding. This fact will be added to status section of the MYTR. However, a Hanford need statement for sludge mapping must be provided by the site before Hanford needs and activities can be added.

MYTR	Comments and Suggested Revisions	TFA Response
B202	**In-Situ Waste Characterization**	
INEEL	General comments: 1. This has been identified as the 2nd highest priority for the VCO Program due to the potential cost savings. 2. In the budget spreadsheet, item 4.1.2 indicates that CNDE was given $15K in FY01 to support the VCO program in evaluation/recommendation of nonintrusive tank examination techniques. The VCO Program is not aware of their involvement.	1. $200K in FY02 funding has been added to support a task to conduct feasibility studies on potential methods for application in the field to determine RCRA or Non-RCRA Status of Tank Waste, assuming sampling of the waste is possible. 2. The $15K for CNDE will be allocated from existing TTPs provided appropriate work scope can be identified at INEEL for FY01. A visit to clarify needs and identify potential work is scheduled for 4/01.
INEEL	ID-9.1.04 General comments: 1. Several technologies have been demonstrated to be capable of quantifying, at relatively low levels, VOCs, RCRA metals, and radionuclides. 2. Ion Mobility Mass Spectrometry (IMS) has been shown to be effective in measuring TPBs and other VOCs at low levels. It is not clear if the resolution to satisfy EPA requirements, but testing may demonstrate that it is a viable technology. 3. The PINS system shows promise in the detection of elemental species inside tanks. Specifically, cadmium, lead, and mercury can be clearly detected through tank walls. 4. Secondary IMS is another technique that can detect RCRA metals and radionuclides in tanks. These technologies warrant evaluation to determine if they can be adapted such that they can be accepted by EPA for use in screening tanks to determine RCRA versus non-RCRA status. This could provide significant over baseline approaches of sampling and analysis.	1. Documentation of the demonstrations can be used to plan the feasibility study. 2. IMS will be included in the feasibility study. 3. PINS probably does not have sufficient sensitivity to measure elemental species at RCRA limits, but data will examined in the feasibility study. 4. Secondary IMS does not exist. Secondary IMS will be examined as part of the feasibility study.
B203	**Residual Waste Sampling**	
	No comments received.	
B205	**Continuous Emissions Monitor for Offgas Analysis**	
CHG	Generally agree SOx in off-gas is an issue (as are other gases identified in this technical response for ID). Off-the-shelf technologies will likely suffice for all gases. There is little technology development needed for Hanford WTP.	Off gas analysis using commercial technologies has proven not to be a straightforward application process at the SRS DWPF and with incinerator gases. A DOE site wide effort to solve deployment problems is envisioned as being beneficial to all parties needing offgas analysis capabilities. Plans for offgas monitoring development at Hanford will be postponed and ultimately cancelled if interest does not develop.

MYTR	Comments and Suggested Revisions	TFA Response
INEEL	General comments: 1. These needs are not considered high priority at this time, and are not critical path. SO_2 Continuous Emmission Monitoring System (CEMS) are proven and commercially available. CEMs for other gases are also commercially available (i.e. O_2, CO_2, CO, NO, NO_2, and THC) and have been proven for high NO_x calciner offgas. The appropriate development and/or demonstration that should be supported includes: • CEMs for Hg and particulate. Units are developed but have not been EPA-approved. Efforts should be focused in this area and coordinated with TMFA. • Lower life-cycle cost/better performing CEMs to replace commercially available units, such as FTIR based CEMs. • Certain types of SO_2 CEMs may not be suitable for high NO_x environments. These should be demonstrated and performance validated. 2. Funding should be reduced to a total of $250K for FY02 to support SO_2 validation ($50K), Hg and particulate CEM work ($100K, coordinated with TMFA), and FTIR/other technology CEMs for high NO_x streams ($100K). Surplus funds, particularly in outyears, could be shifted to MYTR B722, which seems to be significantly underfunded for lifecycle needs. INEEL will work with the TIM to define more detailed scope.	1. Development of Hg and particulate CEMs is the domain of TMFA. CMST/TFA will keep INEEL HLW program informed of developments. Replacement of existing CEMs with more state of the art devices (e.g. diode laser absorption) can be done where technology development is required. 2. $250K TFA funding and $25K site funding for FY02 will be proposed for SO_2 validation and FTIR/other technology CEMs for high NO_x streams.
B232	**Dry Materials Sampling**	
WPI	Recommend a linkage to pretreatment and treatment activities be called out to ensure the data quality objectives defined by B232 are inclusive of the needs for downstream process steps.	The following was added under Technical Approach in the MYTR: "The data quality objectives will be driven in part by the need to know CV of key elements in the calcine bin sets that will affect the design of the vitrification process flow sheet and hardware. In particular, the CV of Na, S, and Al have already been identified as waste components which could cause problems with glass durability, melter corrosion, and crystallization within the glass, respectively, if their concentrations are not well known and regulated in the calcine feed to the melter. Additionally, the CV of Hg, halides, and nitrates is needed to design the flowsheets and hardware to control melter off-gas emissions."
B246	**Tank Waste Sampling**	
	No comments received	

MYTR	Comments and Suggested Revisions	TFA Response
B264	**Improve Waste Analytical Methods**	
CHG	For Tc studies, need to look at complexed waste (organic complexants present in actual Hanford CC waste, for example) when doing the round robin tests. For rapid analysis (of staged waste after pretreatment and waiting to feed the melter), the discussion does not explain what will be done, or if the SRS approach will meet the Hanford need. New and different approaches may be needed. Discussions at Hanford suggest measurement turnaround time of 10 hrs or less will be needed.	To emphasize the Tc analysis need, the following was inserted into the Summary Need Statement: "Historically, discrepancies from sample to sample or interlab comparision tests have occurred with Hanford complexed wastes. There is a need to verify that current laboratory procedures have adequately addressed the discrepancies." Regarding, the DWPF method to reduce analytical turn-around time on feed samples to the melter from 24-72 to12-16 hours, the point of contact (Roy Beck, 803-208-6478) was provided so that CHG personnel could pursue this information for additional details. The reduction in time was achieved mainly by reducing the slurry sample size from 15 to 1 ml and eliminating the time consuming step to take it to dryness before adding acid to fully dissolve the sample. Roy Beck felt that the 12-16 hours turn-around time could be reduced further by adminstrative procedures but currently it was not needed.
B278	**Slurry Transfer and Tank Waste Mixing Monitors**	
CHG	Specific comments are: 1. Please add to the last sentence of the Summary of Need the phrase "low-concentration solid (e.g., less than 10 wt% solids)" between "total amounts of solids in" and "slurries transferred through a pipe. 2. Please insert a sentence in the second paragraph of the Technical Approach approximately the fifth line, after the sentence ending "or monitoring solids in a pipeline." Insert "Note that the in-tank method of measuring wt% suspended solids is also acceptable for the Hanford Science Need as long as the measurement can be taken at a location adjacent to, or representative of, the transfer pump inlet." 3. Please insert "or in-tank" in the last sentence of the second paragraph of the Technical Approach between the words "pipeline" and "DCMS"	The MYTR text was modified as requested.
WPI	Recommend incorporating results from testing of in-line slurry monitors in GAAT W-9.	Only one Coriolis monitor was used in-line to monitor the GAAT transfers. Although the monitor demonstrated the factory precision (i.e., ± 0.0005 SpG) for density measurements in the field, it was not a measure of wt% suspended solids. However, the MYTR was updated to include the results of the ORNL data reduction on the FIU cold loop studies and the approval of the SRS review board for FIU to begin fabrication of the full-scale prototype.
B279	**Two-Phase Liquid Detection**	
CHG	Comments on sulfate layer detection previously supplied appear to have been incorporated. For organic dispersed within waste, approach of Raman probe seems fine, but needs to distinguish separable phase organics from dissolved organics.	The need to distinguish separable phase organics from dissolved organics has been inserted into the MYTR.

MYTR	Comments and Suggested Revisions	TFA Response
B292	**Contaminant Migration Monitors**	
CHG	Subsurface Contamination Focus Area (SCFA) needs to become integrated with the SST retrieval work to clarify the potential leaks of concern for migration issues to remain relevant. The TFA basically has given SCFA full authority for the tasks described in the three Technical Responses: B292 (Contaminant Migration Monitors), B950 (Barriers for Tank /Disposal Facility Closure), B958 (Data and Tools for Performance Assessment). However, TFA and the tank waste user community must be kept fully involved. The TFA response should recognize this role. A paragraph like the following should be included in the response: "The TFA recognizes the lead that SCFA has taken in leading the effort for this cross-cutting need. TFA will work closely with SCFA to ensure that the tank waste community is fully involved with the planning and implementation of SCFA actions addressing this need. The involvement of the tank waste user community is particularly important as the needs may have important project-specific impacts and requirements." Since the time that the Hanford Groundwater/Vadose Zone Integration Project was formed under the sponsorship of Undersecretary Moniz, the affected Hanford Site activities have worked together to identify common needs. These projects agree on the importance of the needs and that the stress for these activities should be on technology deployment, not on further scientific research.	The TFA understands that at least three Hanford Site projects including the Hanford Groundwater/Vadose Zone Integration Project, the LAW Disposal Project, and SST Closure Project have worked together to identify common needs and have submitted these needs to both the TFA and the SCFA. The TFA recognizes that SCFA has the EM-50 charter and the core technical expertise to address these specific needs and has, therefore, forwarded the needs to SCFA for their consideration. However, the TFA will continue to be an advocate for the sites for the needs that are best addressed by other focus areas and will function as a partner on the projects selected for funding. The TFA further encourages the site to continue to work directly with SCFA to ensure involvement of the user community.
INEEL	No comments. These needs are low priority for the HLW and VCO Programs, at this time.	No action required.
WPI	These needs have been assigned to Subsurface Contamination Focus Area.	No action required
RETRIEVAL		
B303	**Waste Retrieval from Confined Spaces**	
WPI	Need narrative deals with heel retrieval whereas the response is for Retrieval from Tank Annulus.	SRS Need SR01-2037 is composed of at least 20 needs that are addressed in a number of different responses. B303 deals specifically with the need identified for retrieval technology for disposition of the interior and annular space of Type I, II, and III waste storage tanks.
B310	**Tank Decontamination and Dismantling**	
WVDP	General Comment - WV could use some help in developing a HLW Tank exhumation plan.	Technical approach expanded to include "An outline tank exhumation plan will be provided as a framework for looking at feasibility."
WPI	Approach does not show a linkage to tank closure efforts at SRS. Result of such a linkage could result in a new alternative where only selected tank components are removed and the shell is left in place and grouted.	WV need OH-WV-904 is composed of 2 needs dealing with in tank stabilization and tank removal. This response deals with tank removal. Tank stabilization is addressed in MYTR B985.
B311	Long-Length Equipment Handling	
WPI	Not clear if response is adequate, need deals with heel retrieval, whereas response deals with retrieval, decontamination, and disposal of "large" equipment. Response as stated does not show a link to the closure requirements.	SRS Need SR01-2037 is composed of at least 20 needs that are addressed in a number of different responses. B311 deals specifically with the need identified for tank top flushing, decontamination, and remote size reduction methods.

MYTR	Comments and Suggested Revisions	TFA Response
B331	Dry Solid Waste Retrieval	
INEEL	General comments: This is a lower priority need and is not critical path. Chemical and physical characterization of the calcine in the bin sets is much higher priority, and a precursor to calcine retrieval. These activities will not be necessary for a few years. The resources could be shifted to the calcine characterization needs.	This low Site priority will be reflected in theIPL scoring. Characterization of Calcine IPL scoring should be based on higher Site priorities.
B333	**Dry Materials Transfers and Blending**	
	No comments received.	
B335	**Transfer Line and Piping Improvements**	
WPI	Recommend a linkage to SRS efforts for temporary transfer line (TMS 3092) and discussions with Hanford staff responsible for the movement of slurry within the tank farms.	SRS has dropped its need for temporary lines.
B338	**Containers for Waste Slurry Transport**	
INEEL	General comments: INEEL will most likely not be able to quantify needs relative to IX resin transportation until FY03. FY02 initiation may be too early and this entire effort should probably be moved out one year.	This activity scored low on the IPL and will be reconsidered next year.
B339	**Feed Slurry Erosion Testing**	
CHG	Need results with actual Hanford waste, including long-term studies. Some simulant studies can be done to support the actual waste work.	The testing strategy will include actual wastes and simulants. The availability of actual wastes may limit the scope of testing.
B352	**Remote Systems for Pit Operations and Maintenance**	
WPI	Needs and responses generally deal with transfer of materials to/from pits. Although, write-ups are extensive in terms of history and potential alternatives, they do not clearly state the intended need. The result is in an inconclusive evaluation of the conformance of the specific Response to its intended need.	The need is an as low as reasonably a chieveable (ALARA) (rad exposure) method of effectively performing this work at Hanford and, using the lessons learned from this Hanford work, plan tank component remote disassembly at SRS.
B359	**Waste Mobilization and Mixing**	
CHG	Further analysis of AZ-101 data should be done as a basis for ongoing technology development and is needed.	This part of the response is in B387.
CHG	Increase emphasis on scope relevant to Hanford, particularly on mixer pump operational improvements. In the Technical Approach: First paragraph. There is a need for process performance and operational optimization (effective cleaning radius, operational improvements) of the existing baseline technology. There is a need for increased reliability/longevity, primarily hardware optimization which contributes to increased reliability. This need has clearly appeared in all the recent mixer pump deployments at SRS and Hanford (liquid column, bearing failures, vibration problems, etc.) Task A. Specific features and potential virtues of alternate concepts over the baseline mixer pump should perhaps be briefly addressed for the un-informed reader. Example: What potential advantage does the ADMP hold over the	SRS needs were the focus of this response due to my inability in locating a contractor staff member that would admit to anything more than an interest. (Also, no RPP $ allocated in FY02) These needs are expressed in Summary of Needs 1) and 2). Words have been added to Detailed task Description I) and B). Words have been added to Detailed task Description A).

MYTR	Comments and Suggested Revisions	TFA Response
	conventional design?	
	Task C. Specific features and potential virtues of alternate concepts over the baseline mixer pump should perhaps be addressed for the un-informed reader. Example: For the Flygt Mixer: low cost (presumably), compact, submersible, simplicity, bulk mixing/suspension and unidirectional flow capability, lower power input, no retention cavities, etc.	Words have been added to Detailed task Description C)
	Task H. Recommend adding the words at the end of the last sentence, "if needed."	Words have been added to Detailed task Description H)
	Task I needs to address reliability and longevity. Progress to Date section	Words have been added to Detailed task Description B) -- Vs I).
	Task C. RPP has funded and completed a preliminary evaluation of the technology for extended sludge retrieval, but also in the context of broader retrieval applications.	Words have been added to Progress Section C)
	Key Products section Third bullet: Insert "Retrieval" between "Sludge" and "testing," The crosswalk table provided by TFA identifies this Technical Response B359 as addressing STCG Need Number RL-WT054-S. However, this STCG Need is not identified as part of the list in B359and none of this response addresses the need identified in RL-WT054-S. The RL-WT054-S Need Summary requires "Validated mixer pump performance correlations, i.e., effective cleaning radius (ECR) as a function of definable properties", which relies on accurate computational fluid dynamic modeling. The accuracy of the computational fluid dynamic modeling can be improved through modeling the performance of the actual pump design under actual tank waste retrieval conditions (i.e., recently completed mixer pump test in Hanford's tank 241-AZ-101). Either this response should be modified to include the scope identified in RL-WT054-S or that need should be combined with other related needs if they exist.	Done This need was moved to response B-387.
WPI	The described Technical Approach does not have a global strategy to integrate the results from the prior deployment of mixing and mobilization technologies. References to technologies other than Flygt mixers and Russian PMP (such as pit bull or AEA fluidic systems) are not provided in the Approach discussion.	The Pit Bull is a transfer pump and the AEA Fluidic retrieval system has not yet shown itself as a contender for large tank mixing. It appears to be destined for service as a mobilizer using relatively shallow supernate depths. So far, Long shaft mixers dominate our large tank mixing experience.

MYTR	Comments and Suggested Revisions	TFA Response
B361	**Heel Retrieval from Obstructed Tanks**	
WVDP	1. Under Technical Approach Section change "floating vehicle based cleaning system" to "remotely operated cleaning systems such as a long reach remote arm" 2. The WVDP technical approach will also include the identification and deployment of tank chemicals cleaning applications. This will include selection of the appropriate acid and methods to apply to the tank surfaces. 3. As a prerequisite to using acid for tank final cleaning a leak mitigation plan is needed to address a tank perforation from acid . 4. In order to evaluate the effectiveness of tank cleaning operations performed in FY 2002 a method to sample the residuals remaining on the tank bottom is needed. Design, fabrication, mockup testing and deployment of a tank bottom sampler will be necessary.	Changes incorporated into the MYTR.
B362	**Low-Liquid Volume Saltcake Retrieval**	
CHG	Approach needs to increase the emphasis on creating a more robust technical basis for this technology, including broadening the perspective to complete saltcake retrieval. Increase emphasis on understanding what happens toward the end of the retrieval campaign and the progressively slower retrieval that will naturally occur. Need to focus on determining the optimal steps for retrieval and critical issues. Renaming this "Saltcake Retrieval", invites expansive thinking on the complete problem and a more robust solution.	These changes have been entered in the MYTR. The title "Salt Cake Retrieval" would indeed be better, but the old title is locked into the IPABS database for this year.
WPI	SRS Needs statement does not provide a near-term schedule. The statement indicates only that closure is required by 2022. SRS Needs statement is sparse in regard to providing specific expectations and in providing other information.	The TFA has no control over the completeness of Site Needs Statements. Where data is lacking, the TFA determines the missing information directly and considers that material in the preparation of the Technical Responses.
B363	**Chemical Cleaning of Tanks**	
WPI	Recommend a linkage with target site pretreatment and vitrification activities to ensure that promising chemicals do not adversely impact downstream processing steps.	The SRS performer of chemical analysis has this relationship as one of his test objectives.
B365	**Waste Transfer Pumping**	
CHG	Summary of Need(s) section, first sentence of the second paragraph needs to be replaced. Suggestion: At Hanford the DST and Waste Feed Delivery project must transfer supernatant, sludge, and slurries out of the DSTs to the Waste Treatment Plant. When only supernatant is being transferred, a goal is to minimize solids entrainment. When sludge and slurries are being transferred, then it will be necessary to operate the mixer pumps and transfer pumps simultaneously.	Change has been entered in the MYTR.
B367	**Unobstructed Tank Heel Retrieval**	

MYTR	Comments and Suggested Revisions	TFA Response
CHG	Approach "E" needs to more clearly involve expertise on waste physics and chemistry to complement the mechanical systems expertise. In support of the cold test facility, need to coordinate summary of simulants specification and development across the DOE complex, and then define the best simulants for specific Hanford testing needs.	Change has been entered in the MYTR.
ORR	OR requested $200K in FY01 for Russian Pump tests. We need funding in FY02 if not received in FY01. $200K for GAAT equipment disposition is insufficient to refurbish and transfer the MDULA and Houdini I in FY02. Initial cost estimates were $500K for MLDUA and $320K for Houdini I. Ben Lewis received funding in FY01 to assist in design of Hanford cost test facility. FY02 support is expected.	Funding has been requested for Russian Pump tests in FY02. The TFA Management Team needs to address this. Support from Ben Lewis has been requested for FY02.
B374	**Remote Technologies for Process Cell Operations and Maintenance**	
WPI	Response schedule does not support need date (prepared in Oct. 1999)	This response is low on the IPL and will be reconsidered next year.
B376	**Pipeline Plugging Prevention, Unplugging, and Cleaning**	
CHG	Increase studies on alternate transfer approaches, such as gas-liquid mixtures, that minimize risk of plugging. An example is the evaluation of complete pneumatic conveyance and air conveyance assistance of transfer pump operation. Develop a better understanding of the true critical velocity for pipe flow, considering the constraint of limited water use to maintain DST space and the desire to minimize water addition. Need to increase emphasis on developing instrumentation and methodology to find the smallest dilution flow with an acceptable risk for the onset of plugging.	Changes have been entered in the MYTR.
B382	**Horizontal and Small Tank Sludge Mixing and Retrieval**	
WVDP	As a result of the need to continue retrieval of residuals adhering to the walls and other internal surfaces of the HLW tanks, cleaning and flushing of the vitrification facility piping, tanks and process equipment as well as tank 8D-4 will continue throughout FY2002 on a limited basis. Final flushing may occur in FY2003.	Changes have been entered in the MYTR.

MYTR	Comments and Suggested Revisions	TFA Response
B387	**Improved Mixing Methods**	
CHG	Conduct further screening of improved mixing and mobilization methods. Combined approaches (complementary mixer pumps/methods) need to be evaluated with modeling or experiment, as appropriate. In the Summary of Need(s) section: Item 1. Suggest deleting "also" in first line. Suggest deleting "both" in third line. Suggest adding a period in the third line between "tanks" and "Safety." Item 4. Suggest adding "either minimize or" in the first line between "can" and "remove"	Changes have been entered in the MYTR.
WPI	Task 3 of the Technical Approach discusses dynamic modeling of the mixing process and focuses on data from AZ-101. Recommend that the data needs for the model are identified and used as a guide for data collection activities from future mixing studies. In addition, recommend that data from previous mixer technology deployments, such as Flygt Mixer at SRS; AEA fluidic jet mixers at Oak Ridge Reservation (ORR); pulsed-air mixers at ORR; and Russian Pulsating Mixer Pump (PMP) at ORR, be reviewed to further validate models and to determine the flexibility of models for different mixing systems.	Changes have been entered in the MYTR.
B3S2	**SST Retrieval from Potential Leaking Tanks**	
CHG	Update the Technical Response to reflect more details of what will be tested. Identify and test very low water approaches, local water addition approaches, dry retrieval approaches.	Due to a late start, the identification of testing has not yet happened. There will be a review of this later in the year to verify that technology selected for testing is appropriate.
WPI	Need refers to demonstration of "retrieval technologies that use little or no liquids to mobilize and retrieve tank wastes" whereas the response is a broad-base study without mention of the minimum liquid requirement.	Changes have been entered in the MYTR.
	PRETREATMENT	
B501	**INEEL Integrated Radionuclide Separations Process**	
INEEL	General comments: Separations technologies are applicable to pretreatment of dissolved calcine, as one potential treatment alternative, which is lower priority than the SBW vitrification activities. Funding support in FY02 is not expected to be available except to possibly support development of data necessary to determine if chemical separations alternatives are viable options for calcine treatment (i.e. cost or performance criteria). This may be dependent on recommendations resulting from the recent external review of the calcine roadmap.	TFA will be required to meet the International commitments for supporting work in Russia. At the road-mapping meeting the end of February the TFA team recommended the task be brought to its logical conclusion in FY03 in order to support a final decision scheduled for FY05. The TFA road-mapping team recommended this be funded by the site and TFA at the level proposed.
WPI	The ongoing Russian work of UNEX does not meet the user's need to evaluate TRUEX and SREX for application at Idaho National Engineering and Environmental Laboratory (INEEL). The focus on UNEX is understandable given the Russian origin; however, the primary extractant, cobalt dicarbollide, is unstable and at 40 degrees C will 50% decompose in 83 days. If the temperature increases to 60 C, the extractant is half gone in 6.5 days. SRS removed the UNEX process from consideration as a replacement for the TBP Process. The	TFA will check on the temperature effects, but the degradation has not been seen in several long-term tests at both KRI and INEEL. The researchers at INEEL and KRI are not aware of degradation problems and have not seen any problems in 7 years of study. In addition a cobalt dicarbollide process is in use full time in Russia at Mayak, with no observed problems. INEEL has conducted long term testing (greater than 70 hours) at a loading temperature of 25C and a stripping temperature of 60C. No degradation was seen. If there were any degradation even

MYTR	Comments and Suggested Revisions	TFA Response
	impact of the decomposition products on UNEX performance is unknown as is the impact on final immobilization processes and products. The question, "What is cobalt dicarbollide?" has been difficult to answer. The formula appears to be $Co(C\text{-}2, B\text{-}9, H\text{-}11)_2^-$ with an uncertain chemical structure. There is a shopping list of issues regarding dicarbollide supply, purity, stability, unknown contaminants, radiation stability, etc. The FY02 testing does not use actual INEEL wastes and the FY03 availability of actual INEEL waste is uncertain. Prior to proceeding, stability with regard to radiation should be verified.	at low levels the analytical work would have seen this. Certainly, a half-life of 6.5 days would have been seen. Chlorinated cobalt dicarbollide is known to decompose in alkaline media, which is irrelevant to processing acidic solutions at the INEEL. Furthermore, cobalt dicarbollide is well characterized and understood. The reagent is currently available on a commercial basis from the Czech Republic. SRS decision on Cs removal is irrelevant. SRS is using a solvent extraction method designed for caustic side. Cobalt dicarbollide is an acid side process. It could be modified for the caustic side, but was immature when compared to the Moyer approach. The FY01 testing is done on one type of real wastes. Three samples of different calcine are in storage at INEEL and will be used over the FY02 and FY03 timeframe to demonstrate the process will work on zirconium calcine, on Al calcine, and on a mixed calcine. Real waste testing is a corner stone of this work. Significant radiation stability testing has been done, and this is not a problem. In addition, the chemical stability is excellent. The TFA road mapping panel in February is recommending the entire SX effort be applied to UNEX because the process is simple and offers real benefits over TRUEX and SREX. The process has matured rapidly over the past 2 years and with the planned FY2002 and FY2003 work will be adequately evaluated to allow down selection.
B508	**Decon and Filter Leach Processes Waste Volume Reduction**	
WPI	The technical response does not contain enough description of past work to clearly indicate what is needed in the future to meet the need. The task of "Screening of new commercial decontamination vendors is ongoing" does not indicate any focus toward a site need.	The response has been modified. The need response was quite well received at INEEL by both the operations and technical side.
B511	**Sodium Salt Removal for Waste Volume Reduction**	
CHG	Remove specific reference to S-112 retrieval (in the Technical Approach, third paragraph, and the Key Products sections) and allow for this to be demonstrated on a DST of choice, or in conjunction with SST retrieval.	The response has been corrected.
WVDP	As a result of extending HLW retrieval operations to achieve a higher degree of Tank cleanliness the vitrification facility will continue to operate through FY02. Therefore, WV has made the decision to process its sodium waste into glass by blending with the continued removal and processing of the HLW tank residuals through the vitrification facility. In the event of a melter failure or other unforseen problem, WV will continue to develop a sodium stabilization process on a limited basis.	WV is interested in this only as a backup. Hanford is the primary customer. Discussions with WVDP indicated some interest, but the timing is not appropriate. This is primarily a Hanford need.

MYTR	Comments and Suggested Revisions	TFA Response
WPI	The concept of designing an above ground, skid-mounted HLW processing equipment in a year is also overly optimistic, especially when fundamental safety and process issues remain to be solved.	The ORR design was done in less than a year for all three unit operations. The TRIAD experience on skid mounted equipment was quite successful. Hanford has backed off the fast track schedule, as shown in the last draft, and is now looking for implementation in three years. This is doable.
B514	**Removal of Chloride from Waste Solutions**	
INEEL	General comments: This work scope should be focused in quantifying the expected chloride level and its impact to the tanks and process equipment, such that determinations can be made as to whether or not chloride removal is necessary, or if other conditioning/pretreatment approaches are more appropriate.	Agreed. This is the first step in the task as planned when this is implemented.
B517	**Organic Phase Removal**	
CHG	Emphasis should be on the retrieval of the thin organic layer and not the chemical destruction methods.	Discussions with CHG users and Dr Harry Babad have yielded potentially interesting physical/chemical sorption methods which will be evaluated during the initiation of this task. A revised need response is being prepared. A key question is can we achieve the site requirement of < 25 ppm organics in the feed.
B521	**Acid-Side Radionuclide Separations**	
INEEL	No comments to content. The title should be modified to indicate that the Technical Response addresses mercury removal in the offgas scrub solutions.	The title is fixed in the current IPABS database. We will change next year.
WPI	The user's need is not clearly defined.	TFA has had several meetings with the user, and the needs have been more completely defined. The combined response is at the request of the user to several problems associated with these waste streams.
B532	**Calcine Dissolution Solubility and Kinetics**	
INEEL	General comments: Preliminary calcine dissolution studies on H-3 calcine will be completed in FY01, but these activities are not expected to be funded in FY02 since they are not critical path efforts and are lower priority than the SBW vitrification development activities.	This site priority is reflected in the IPL.
WPI	Half of this work (dissolution kinetics) appears to have been completed in FY01. The other half, (characterization of undissolved solids at INEEL) has no Technical Response. There is 850K funded for FY02 and 700K funded for FY03 without a work scope for either.	The FY01 work is only on H-3 calcine. The out-year work is on the other types of real (not surrogate) calcine, which are already procured and stored. The characterization activities are being done as a part of this task.
B542	**Antifoam Agents for Waste Evaporation**	
CHG	Agents to be used at Hanford should not involve organics that would complicate the WTP process or regulatory compliance.	Agreed. This is part of the planned scope.

MYTR	Comments and Suggested Revisions	TFA Response
B554	**Tank Waste Chemistry**	
CHG	This technical response does not identify tasks to determine the identity of the compounds present in sludges or residuals remaining after caustic leaching. This information was cited as a need in RL-WT090. The information would be a useful guide to development of dissolution and separation processes, and would be good input to the Environmental Simulation Program (ESP) database for predicting solubilities. This response does not address the need stated in RL-WT90 for "a fundamental understanding of aluminum and chromium chemistry," including studies of the relationship of leach rates and solubilities to temperature alkalinity, oxidizer type and concentration, and other potential process variables. In the initial table on page 1, the first entry is somewhat confusing: The need RL-WT90 does not have parts B, C, D and E. Summary of Need section Need related to sludge transport subsection, second line. Typo: replace "use" with "used." Technical Approach section 1.1 This section focuses on the use of simulated Hanford wastes. The results are needed on Hanford actual waste. Typo in third line: replace "Measurements" with "measurements." 1.2 The statement of "kinetic studies of Hanford pipeline transfer" is too vague. Need to address the following issues: rheological properties as function of dilution ratio and temp, precipitation as function of temp, precipitation and dissolution kinetics within the pipeline, critical velocity for particle mobilization, define minimum dilution required. These studies need integrated studies of actual waste, simulants, and modeling. 1.3 Chemical approach does not have merit at Hanford. No need for technology development on chemical approaches. Hanford has too few SS lines to allow effective chemical methods. 2.2 Plugging in the unique Hanford hardware configuration, temperature effects, and chemistry are not adequately addressed. Please better define what is "the salt well pumping loop." 2.3 Last sentence of first paragraph. Please clarify or explain, "The resulting models and correlations will be integrated in the sites waste transport toolkit." First sentence of second paragraph: Typo: delete "of." Please spell out what "CFD" is. 4.2 Need to validate with sludge leaching tests and sludge species as well 4.3 Need to add sludge components 5.3 Make sure correct data is in ESP, need to get kinetic parameters in a kinetic modeling approach in addition to the equilibrium model.	We agree that these are critical issues. They are addressed in B555, Sludge Washing and Dissolution, and B5S1, Removal of key non-Radioactive elements… The letters B, C, D, etc were appended by TFA to the site need number to designate discrete sub-part of the work identified by the need, e.g. B=Leach solution stability. 1.1 Agreed. These are scoping studies by AEAT on precipitation kinetics and properties to develop an understanding of the chemistry. We intend to verify simulant results with data from actual wastes in the out years. 1.2 How and where these issues are addressed will be clarified in the response. Viscosity as a function of composition and temperature are being studied in Task 1.2 with experimental and modeling work and at FIU (Task 2.1). Precipitation kinetics is addressed in Tasks 1.1 and 1.4. Determination of critical velocity is being addressed by engineering scale testing in Task 2.1 and transport modeling in Task 2.3, as well as in retrieval tests at FIU. Dilution requirements for saltcake are addressed in Task 3, tests with actual waste, and Task 4, dissolution modeling. Dilution for slurry transfer is addressed in Task 2.1 and for saltwell pumping in Task 2.2. Task integration (Task 2.3) includes biweekly teleconferences with Hanford users and researchers, and other TFA collaborators at AEAT, MSU, FIU, and ORNL. In addition, we sponsor an annual workshop at Hanford to discuss this work (~40 attendees last year). This task has undergone frequent technical review. 1.3 Aggressive chemical methods will not be considered. Material compatibility is a primary criteria for selecting candidate chemical unplugging methods. Experience and testing indicates that a combination of physical and chemical (including the effect of temperature) methods are most effective for some plugs; some plugs have not been removed effectively with only mechanical means. 2.2 Specific Hanford configurations will be addressed as a logical progression of this work. The "salt well pumping loop" at MSU will be defined in the response. 2.3 Last sentence will be replaced. Site pressure drop and critical velocity prediction methods will be validated and updated. Additional predictive capabilities are being added, including dynamics, assessing plug potential, and evaluating unplugging methods. Computational Fluid Dynamics (CFD) will be spelled out. 4.2 and 4.3 Agree. Sludge components are being addressed in B555.

MYTR	Comments and Suggested Revisions	TFA Response
	Progress to Date section 1.1 First sentence, please add "were" between "kinetics" and "completed." 3.1 Typo: second paragraph, first line: replace "Salcake" with "Saltcake." 3.4 Typo: first line: replace "Salcake" with "Saltcake." In last sentence, suggest that "ORP" be replaced by "Tank Farm Contractor." 4.1 First line: suggest deletion of "these" 4.2 First line: Delete "of." 4.3 Last paragraph (one sentence) "Issues such as charge reconciliation approach and molecular stream generation have been resolved." Suggest a further explanation for the un-informed, or else delete. Detailed Task Description The parenthetical remark says to "See attached spreadsheet." No spreadsheet was attached.	Progress to Date: Corrections have been or will be made. Companion Task Spreadsheet (B554revu.xls) was distributed by TFA with the MYTR MS Word document.
B555	**Sludge Washing and Dissolution**	
CHG	The Tank Farm Contractor (CHG) technical staff requests that the list of tanks identified for Enhanced Sludge Wash in the Key Products section be considered tentative, subject to review and concurrence at the start of FY02. This will permit adjustment of the list of tanks to support more recent work done by the Tank Farm Contractor. This work is on a new wash and leach model for Cr based on tank layer compositions and the drainable liquid inventory to be utilized.	Agreed. Cr will be followed in B555 but new methods to remove Cr are addressed in B5S1. Particular tanks will be selected after conferring with the user.
	Technical Approach Section Hanford 1. It states that BX-110 is "needed to complete the Kupfer strategy." PNNL did testing on BX-110 in FY 98, so it is not needed to complete the Kupfer strategy. 1.1. To date, the solid/liquid ratio has not been included as a parameter in parametric testing. Including this parameter will increase the cost of testing. Furthermore, it states "a minimum of the (sic) sixteen combinations will be tested with each sample." This may cause problems. First, it has not been a painless process getting permission to use archive tank samples for EM -50 testing. There are conflicting needs for these samples. Additional core sampling may need to be done. Second, a 16-parameter matrix will be expensive to implement. It might be worthwhile to perform a statistical design for these experiments to reduce the test conditions, but still generate the needed data.	1.1 Agree that we need to work with the user to make best use of available samples. Agree that statistical experimental design would be beneficial.
	Is a chemical analysis of "cesium" and "strontium" sought, or an analysis of Cs-137 and Sr-90?	Cs and Sr chemical analysis is goal, although radionuclide analysis would be useful.
	1.2 The last sentence about laboratory sludge wash tests may not be possible. Removing Cr is possible by enhancing Cr dissolution under oxidative conditions. However, there may be no viable way to remove sulfate or phosphate from tank sludges other than caustic leaching or acid dissolution/TRUEX.	1.2 Agree. The goal of this task is to measure what happens under near reference conditions. Enhanced methods for removing on-radionuclides are covered in B5S1.

MYTR	Comments and Suggested Revisions	TFA Response
CHG	A lab may be able to perform a chromium-leaching demo (kg scale test). It would be useful to get a kg (or more) chunk of high-Cr sludge and subject it to caustic leaching. Then divide it into two portions. One portion would go through a glass melt-this would give us an indication of what indeed happens if you don't remove the Cr. The other portion would go through oxidative Cr leaching, and then it too would also be made into glass. Sludge phase characterization seems to be missing from the response. The TFA is currently funding work in this area, and presumably they will continue to do so. Knowledge of the specific chemical and mineral phases present in the sludge solids is critical to process design.	Agree with this excellent suggestion. TFA will work with CHG to obtain a "chunk" of sludge. There is ongoing work in this area. The MYTR will be revised to include this work.
B566	**Waste Chemistry During Evaporation**	
CHG	Emphasis on Task 4 (for Hanford) is too small when considering the topic area of evaporation and the potential importance of this to Hanford. Rename and revise Task 4 as follows: Task 4 Optimize Waste Concentration to Increase Available Tank Space A significant amount of space in the DST system can be made available if the waste can be concentrated to higher specific gravity. Current limits on specific gravity of evaporator feed to tanks, as well as specific gravity of bulk tank waste, are derived from safety limits intended to prevent buoyant displacement gas release events (BDGRE) from occurring. These conservative limits are derived from empirical observations of historical tank behavior and are applied uniformly to all tanks. This task proposes a new approach for determining concentration limits, which maintains safe operation while allowing additional concentration leading to more available tank space. Models based on improved understanding of BDGREs have been developed at PNNL. These models allow for tank-specific determination of maximum safe concentration based on tank properties such as gas generation rate, waste layer depths, waste layer specific gravities, etc. Needs for tanks waste data and model validation will be addressed. Bench scale validation experiments will be performed. Strategies for optimizing waste configurations to maintain safe operation while maximizing available space will be developed. Models will be applied to individual tanks to evaluate potential space saving due to additional concentration.	Suggested revision has been incorporated into MYTR.
B584	**Cross-Flow Filtration**	
CHG	Need to add studies of how waste chemistry affects filtration performance and particle size/shape. FY02 work should be open to other enhancement technologies other than filtration aids, for example ultrasonic methods.	Agree. We are studying particle-size distribution growth in B554. The particle shape does need to be taken into account. The task is directed to look at alternative filtration technologies. The MYTR has been revised to include investigation of filter enhancing technologies.

MYTR	Comments and Suggested Revisions	TFA Response
INEEL	Revise INEEL portion of "Summary of Need(s)" as follows: 1. Add the following sentence after the 1st sentence: *In addition, if ion exchange is used to remove cesium and/or strontium from the offgas scrub solution, solids filtration may be required prior to the IX column*. Revise INEEL portion of "Technical Approach" as follows: 1. Revise the 1st sentence to read as follows: The removal of radioactive species (actinides, Cs, and Sr) from solutions of dissolved calcine may be required to accomplish waste treatment strategies, depending on the alternative selected. 2. Add the following sentence after the 3rd sentence: *Depending on the regulatory strategy for disposition of secondary waste streams generated from vitrification of SBW or calcine, there may be a need to remove cesium and other radionuclides to maintain the offgas stream solution at contact-handling radiation levels (i.e. <200 mR/hr) or to ensure it is below NRC Class A concentration limits. This may require an ion exchange column in the offgas stream, which would need solids removal.*	MYTR has been revised to incorporate comments.
B588	**Leaching and Treatment of Technetium for Tank Closure**	
CHG	Approach has nothing on waste inventory measurements – this is a critical omission. Increase emphasis on experimentation, particularly on assessing inventory and the release and migration. Task 1 must also tackle the inventory issue post retrieval. Task 2 should focus on speciation, and include the speciation changes cause by retrieval; de-emphasize Tc removal. Assuming the heel is what remains after multiple retrieval technologies have been deployed, task 3 should emphasize measuring release rate of Tc inventory post closure (including the filler used when closing the tank); eliminate work on more retrieval steps (which is being covered elsewhere). Change title to include Tc inventory.	Inventory assessment is planned and should have been mentioned more explicitly. That includes the inventory after normal retrieval and the remaining inventory after any enhanced treatment. Recent advances in the understanding of technetium inventory at SRS suggest that their predictions of technetium inventories in individual tanks are now more accurately than they were when the "need" was first written. Experimental work will include the use of real heel samples when they are available. Experiments will have to seek the maximum information from the limited samples available. MYTR has been revised to include five tasks: 1) Determine how Tc is incorporated into tank sludge (speciation), 2) Assess impact of retrieval practices on removal of Tc (residual inventory), 3) Demonstrate chemical approaches for removing Tc from tank sludge, 4) Identify source term from tank residuals, and 5) evaluate Tc separations from INEEL calcine wastes. This work is to be closely coordinated with the TFA Closure TIM.
B5S1	**Removal of Key Non-Radioactive Elements from Tank Waste**	
WPI	New task for $250K in FY02 duplicated other technical responses, which also addressed removing non-radioactive elements from tank waste. There was no user identified. Starting laboratory studies from scratch when other technical responses already have recommended commercial technologies for evaluation is of questionable merit. Appears to be duplicative of past efforts.	This MYTR is a TFA strategic investment to address technology gaps not currently identified in site needs. This is a new study that is closely coordinated with B554 and B555. Those tasks will still investigate the behavior of Cr during baseline leaching of different tank sludges. This effort will look at both the selection of oxidants and new methods for introducing oxidants into the sludges to enhance Cr removal. The work is well coordinated with current and past work on Cr behavior and removal and uses a key investigator involved in those efforts. The oxidants are expected to be commercial materials; the application of those materials needs to be tested with several sludges and may need to include innovations.

MYTR	Comments and Suggested Revisions	TFA Response
B5S2	**Selective Chemical Dissolution of Tank Heels to Improve Retrieval**	
WPI	This new start proposes work with simulants for heels in tanks that will not be emptied for years. Hanford has dozens of different, unique heels in tanks that will not be cleaned for years or decades. The chemistry of these heels is largely unknown such that no meaningful simulant can be prepared.	This MYTR is a TFA strategic investment to address a projected long-term technology need. We agree that this is a very difficult task, and the response was not intended to suggest that a few quick and standard experiments will produce meaningful answers. The plan includes evaluation of the best information available on heel compositions. There are few meaningful samples available, and the simulants developed will be tested to see how well they compare with the few samples that are available. The simulants are needed before heel treatment options can be explored. There are not enough heel samples available to test treatment options. Any available samples will have to be reserved for selected tests of only the most promising approach(s). There can be many different heel materials because of both the differences in bulk compositions in the tanks and selected materials that were added to specific tanks may be concentrated in the heels. Although this is a difficult project, it is believed to be a serious problem that we need to begin to address. Even if this relatively low-level effort does develop suitable simulants and identifies suitable treatment approaches in the next year or so, a few more years may be needed to be ready to treat an actual tank. The work is closely coordinated with the TFA Retrieval TIM.
IMMOBILIZATION		
B709	**Waste Treatment Process Flowsheet Model**	
INEEL	No comments on scope; however, we should ensure that this scope is integrated with other related Technical Responses, particularly B722 tasks associated with offgas treatment development.	The scope that INEEL has in the other tasks B768, B722, B719, & B773 is intended to guide that integration.
WPI	The stated technical approach is focused on the SRS flowsheet and experience, which may not be flexible enough for a different proposed path for the INEEL calcined HLW stream. Expertise gained at SRS may not be applicable to INEEL due to differences in waste properties and proposed waste processing steps (note that the existence of differences or similarities are not stated in the approach).	SRS is the currently the only site with a functioning integrated flowsheet and property databases and models to support the flowsheet. However, SRS databases are designed to an old proprietary DuPont flowsheet model. The models and databases are being adapted to commercial software and at the same time being made available to Idaho for use in their models. Similar activities are supporting Hanford via work for RPP.
B719	**Conditioning and Immobilization of Low-Activity Waste**	
ORR	OR is expecting funding in FY02 to complete ongoing activities. We did not see funding for this scope of work in the technical response.	There was a typo in the spreadsheet that was misleading. That has been corrected as discussed with Ms. Noble-Dial and Ms. Robinson at midyear.
ORR	The development work done this FY on the ORR Melton Valley storage tanks stabilization task has brought up several technical issues which will require R&D into FY02. Until these recent results were received, we thought the development efforts could be completed in FY21. We have now determined that FY02 funding will be required to address these technical issues above the closeout funding originally discussed for this task. The Immobilization TIM is aware of these results and is hopefully already incorporating the task in FY02 planning.	Agree. That scope is included in the technical response but was clouded by the typo referenced above.

MYTR	Comments and Suggested Revisions	TFA Response
WPI	Alternatives to grout may need to be identified for potential problematic waste streams such as mercury, sulfate slag, and organic resins?	Agree. That is part of the scope.
B722	**HLW Process Offgas Treatment**	
INEEL	General comments: This Technical Response is a little under funded for FY02, but appears to be significantly underfunded in outyears, and will most likely not satisfy INEEL performance milestones established by DOE-ID. Additional funding may be available from proposed reduced funding for Technical Response B205. Proposed scope and funding levels are as follows: • Integrated process modeling for system selection, design, optimization and testing $135K • Test reference offgas system on pilot scale melter$300K • Modify reference offgas system as required$200K • Technology specific evaluations (i.e. PM effects in de-Nox process, GAC performance, treatment/disposal of GAC, etc.) $200K • Regulatory and stakeholder participation support $100K (Note: First and last tasks are expected to continue at $100K through FY06, the other three tasks are expected to continue at the levels shown through FY04.) We will work with the TIM as appropriate to developed more detailed scope for this Technical Response.	Agree in general. In FY02, this task is to be leveraged with the flowsheeting (B709) and melter improvement (B768) task; however, the outyear funding will be revisited per the comments.
WPI	Recommend coordination with B709 to determine potential impacts of pretreatment options on projected off-gas compositions.	Agree. The role of INEEL includes guiding the coordination referenced in this comment.

MYTR	Comments and Suggested Revisions	TFA Response
B730	Acceptance Criteria for High Activity Waste	
INEEL	Revise "Summary of Need(s)" as follows: 1. Reword the 2nd paragraph as follows: *Vitrification of SBW will also result in significant quantities of secondary wastes that may pose challenges to disposition unless they are adequately characterized and regulatory strategies defined. RCRA listed codes will be attached to these waste streams. RCRA Subtitle C regulation of these listed waste codes would have significant impact on the life-cycle cost of processing and dispositioning the SBW inventory if they are not adequately identified and addressed (i.e. Hg speciation, SGAC/Hg interaction) during the design and permitting phases. If adequate RCRA delisting strategy is not integrated with process design, development, and pilot-scale research, the costs of retrofitting a permitted and operational process to meet data needs identified at a later date could be orders of magnitude greater.* Revise "Technical Approach" as follows: 1. Revise Task 1) as follows: *INEEL personnel will define waste compliance strategies and data requirements to ensure integration of RCRA regulatory strategy development and implementation with the project stages of treatment process design, development, pilot-scale projects, etc. relative to all waste forms generated during processing of SBW and calcine inventories. This information will then be used to revise the existing…* General Comments: The planned activities are expected to be adequately supported with $200K of TFA funding and $200K of INEEL co-funding.	Will modify accordingly.
WPI	The response does not build upon the waste form acceptance experience gained at WVDP and DWPF. In addition, since vitrification is the preferred alternative for SBW and calcine HLW, specifications contained in the Hanford Waste Treatment Plant contract may provide additional basis for waste form acceptance criteria. The described focus for FY02 does not build upon these earlier efforts. Funding is identified for tasks in the Technical Response, but detail on work scope within a task is not provided.	As noted in the scope, the bulk of this task is the interface between HLW and secondary wastes that are expected to be disposed of as other than HLW. As note in the comment, Waste Acceptance for HLW is well defined at Savannah River, West Valley, and in the Hanford specifications. The scope of this task does not reinvent the previous work but builds off of it and the work already scoped by INEEL and funded by EM-40.
B748	**Testing and Prediction of Long-Term Waste Glass Performance**	
CHG	Previous comments have been included and addressed. The ILAW PA strongly supports this effort. It has been extremely valuable to both DOE and the contractor in the past. Although no site money is requested, the ILAW PA activity will, as in the past, support this activity with staff time and performing follow-on experiments.	This task is integrated with the site experimental efforts and parallel PUFF tests are run on each selected glass to ensure consistency between results. The evaluation of glasses with the PA models has been addressed by the site and will be expected to continue.
WPI	The proposed work does not appear to be linked to EM-40 funded Immobilized-LAW Performance Assessment (ILAW PA) program, technical response B749, nor to the Hanford vitrification contractor; making it unclear how proposed work supports end-user's schedule.	See comment above.

MYTR	Comments and Suggested Revisions	TFA Response
B749	**Glass Monolith Surface Area**	
CHG	Update terminology on privatization vendors to reflect current status. This looks like a good start. However, the site is being asked to contribute $900,000 during the two years of the project. The ILAW PA activity will be spending significant amounts but the total budget for all glass tests for the next two years outside of the Waste Treatment Plant is below this amount.	Will be corrected in the next revision. The co-funding was not correct and good numbers are still not available from the site. Based on discussions with the PA representative, co-funding is closer to $100K for FY02 and unknown for FY03.
WPI	The technical approach does not appear to recognize differences between the Hanford LAW package requirements and requirements for DWPF canisters. Canisters used by DWPF are 0.66-m in diameter and three meters long. Package requirement for Hanford LAW is for a 1.22-m diameter container that is 2.3-m tall. The original Hanford privatization contract had a specification for a glass surface area to volume ratio. Basis documents for this specification provides a good starting point for proposed work. Recommend a linkage of B749 with glass development work and the Hanford private contractor to ensure that glass and processing conditions used for B749 tests reflects plans for the Hanford full-scale facility. Proposed funding level for FY03 full-scale prototype studies appear low unless linked with other vitrification studies.	The initial part of the planned task is aimed at understanding effects of geometry on glass cracking and small-scale tests were planned with the intent to increase scale until confidence is sufficient. Agree. The task must be linked to the current work on the performance assessment for Hanford.
B751	**Alternative HLW Waste Forms**	
INEEL	General comments: 1. Performers are unclear, as is the expected co-funding sites; however, since only INEEL needs are addressed, it is assumed that all co-funding is expected from INEEL regardless of the performer. 2. These activities are low priority for INEEL and will not be cofunded in FY02.	The TFA performer selection process has not been initiated and will not be initiated until it is determined it the task will be funded in FY02. Since it is a low priority for INEEL and will not be co-funded in FY02, performer selection will not be addressed in FY02.
WPI	The technical approach for the compositional variation study does not show a linkage to waste form criteria, nor to proposed processing options for the INEEL waste streams. Proposed work would be strengthened by the identification of parameters to be measured for the various formulations to be tested. Because the proposed work is not tied to a flowsheet and process evaluation work proposed for INEEL calcine HLW and HLW component of SBW, it does not appear the work will support the user's timeline.	Agree. During the preparation process for the MYTRs, INEEL's priorities have changed as shown in the above comment. This task is not planned for funding by either TFA or INEEL.
B753	**HLW Canister Closure and Integrity**	
	No comments received.	

MYTR	Comments and Suggested Revisions	TFA Response
B768	**Specify and Enhance Design of HLW Glass Melters**	
CHG	Modeling needs to include recent advancements from EMSP on spinel, and adapt to noble metals. Approach needs to increase emphasis on Hanford melter design issues (in particular, fate of noble metals). Approach needs to increase emphasis on higher temperature melters.	Agree. The EMSP task has been performed out of PNNL. The technical team which includes SRTC, PNNL and INEEL are aware of the work by Pavel Hrma on spinel settling and will include as applicable to this task. Higher temperature melter are still being addressed in a separate strategic task (B7S2) and if successful will be incorporated into B768 in FY03.
B769	**Conditioning of HLW for Immobilization**	
CHG	Summary section 2nd and 3rd paragraph are not related to melter topics and should be deleted. Remove RL-WT088 as target need. Rewrite technical response. Discussion of four melter general areas is good.	The paragraphs referred to are related to Idaho's need and are valid. The task addresses preparation and understanding of the feed for processing in a melter. Rheology is important to maintaining homogeneous slurries that do not segregate during processing. This task addresses those types of issues. RL-WT-088 will be removed.
INEEL	The performer on this Technical Response is not clear, nor are the cofunding requirements.	The performer selection process is separate and follows the development and documentation of the MYTRs. Co-funding by INEEL was still being determined at the time of the preparations of the first draft of the MYTRs. Cofunding determined at the Midyear meeting indicated that INEEL would provide $400K and ORP would provide $200K.
WPI	Proposed work appears to be duplicative of efforts that have been performed for WVDP and Hanford Tank Waste Remediation System effort. During the early 1990's, Pacific Northwest National Laboratory (PNNL) evaluated a number of dryer/calciner technologies for HLW streams. Since there is a strong basis for processing a slurry waste stream, it is not clear what benefit a drying step provides for the SBW or separated HAW stream from a dissolution step for calcine HLW. Proposed dry feed work is applicable to INEEL to support direct vitrification of the calcine HLW stream. The two tasks do not appear to have overlapping work scope between the INEEL need and Hanford need; therefore, the technical response could be divided into two separate responses.	Always the overriding benefit for reducing water in the feed to a melter is that melters are relatively poor evaporators and both melter size and throughput are negatively affected by water content in the feed. WVDP, Hanford and SRS evaluated dryer/calciner technology for HLW streams for caustic slurries. INEEL waste streams are acidic, similar to those of the Europeans, and are candidates for evaporators, and possibly dryers, or calciners depending on the nature of the stream post pretreatment. The following steps are extremely interdependent: glass former addition, adjusting redox, maintaining sufficient viscosity to prevent melter feed segregation, maintaining mixing prior to feeding the melter. These steps must be developed jointly to avoid problems any one of them.
B773	**Improve Waste Loading in HLW and LLW Glasses**	
CHG	Change title to reflect waste loading improvements in LAW in addition to HLW. Increase emphasis further on sulfate issues and increasing practical sulfate loading in LAW melters.	Agree. Will address through program executive guidance.
WPI	The proposed budget does not appear to be sufficient for the identified work scope based on the absence of budget values for a number of line items in the response spreadsheet	Will revisit during this revision to ensure that funding and deliverables for FY02 are consistent.

MYTR	Comments and Suggested Revisions	TFA Response
B777	**Remote Disassembly of HLW Melters and Other Processing Equipment**	
INEEL	General comments: 1. This is a low priority task for INEEL and will not be an issue for several years; however, the conceptual design of the SBW vitrification facility will begin in FY02 or FY03. The data developed through evaluations and lessons-learned from SRS and WVDP need to be factored into the overall design. The same is true for Hanford. Some funding should be provided to INEEL and Hanford to be involved in the planned activities within this Technical Response to support design activities at these sites.	Hanford has expressed interest in receiving the test reports and test plans, which will be provided. Agree. Since the task is in the planning stage for a generic demonstration of glass removal, test plans and experimental results can and will be provided to INEEL and the extent of participation will be discussed with the technical contacts and adjusted as appropriate.
WVDP	The new West Valley STCG need is not included. Should add: OH-WV-919, Melter Disassembly & Large Scale Vitrification Expended Material Processing The referenced third activity "continued deployment of VEMP" should also acknowledge the WV Lead role at development of equipment suitable for "D&D" (e.g. size reduction, segregation, packaging...etc.) of a larger class of vitrification process equipment. This activity is closely tied to activities 1 & 2. The ASTD funding was a one-time "grant"(currently, FY01, working from carry-over from previous years) and is anticipated to be spent by the end of FY01. Additional funding will be required for continued activity in the out years.	Agree. Will include the new STCG need. The third task is shown as being completed. The expected coordination between the tasks is to ensure that lessons learned from the VEMP program are translated to the melter disassembly and disposal through the participation of West Valley in the over all task.
B7S2	**New Melter Technology**	
INEEL	General comments: 1. TFA funding and co-funding levels are not provided.	The current draft shows $520K in FY02 which includes technical support by Joe Perez and Dennis Bickford and Rod Kimmitt and funding for actual testing in Russia and France. Cofunding is expected to cover the preparation and shipment of simulants as required, technical review of the reports, and some of the travel for review and evaluation of the tests.
WPI	Although the heating method used in a Cold Crucible Induction Melter (CCIM) is different than a joule-heated melter, it appears that problems associated with a joule-heated melter may also exist in a CCIM since glass properties such as electrical conductivity and viscosity are important for both systems. Recommend that proposed work address the potential for similar problems to exist in both systems. It is suggested that the results from the FY01 melter study be used as a basis for the addition of another task that would identify a path forward for a vitrification technology that may operate with a wider range of glass properties than is possible in either a joule-heated or CCIM system.	Agree. The wider range of glass properties is already a part of the existing task. The property most limiting for glass formulation is the liquidus, which is greatly alleviated by the option of higher temperatures. But as mentioned in the comment the other glass properties cannot be ignored and the current glass formulation plan considers the importance of evaluating key glass processing properties.

MYTR	Comments and Suggested Revisions	TFA Response
	CLOSURE	
B923	**Enhanced Grout Formulations for Tank Closure**	
INEEL	General comments: 1. It is unclear if the participating sites will be provided funding to support and provide waste stream data to the grout testing activities of the performers.	The competitively selected performers do plan on providing the Idaho some limited funding to support the effort. This type of support is typically considered part of site cofunding.
B924	**Tank Closure Criteria/Decision Support**	
WPI	The TFA is on hold to address INEEL needs pending regulator and other compliance modifications. Uncertainties for INEEL waste make it unclear what need the response is intended to satisfy.	Until INEEL achieves regulator approval for its tank closure process, it has decided to not close its tank closure criteria need statements. This situation will be reevaluated once regulatory comments on Idaho's closure process are obtained.
B950 **B958**	**Barriers for Tank / Disposal Facility Closure** **Data and Tools for Performance Assessments**	
CHG	SCFA needs to become integrated with the SST retrieval work to clarify the potential leaks of concern for migration issues to remain relevant. The TFA basically has given SCFA full authority for the tasks described in the three Technical Responses: B292 (Contaminant Migration Monitors), B950 (Barriers for Tank /Disposal Facility Closure), B958 (Data and Tools for Performance Assessment). However, TFA and the tank waste user community must be kept fully involved. The TFA response should recognize this role. A paragraph like the following should be included in the response: "The TFA recognizes the lead that SCFA has taken in leading the effort for this cross-cutting need. TFA will work closely with SCFA to ensure that the tank waste community is fully involved with the planning and implementation of SCFA actions addressing this need. The involvement of the tank waste user community is particularly important as the needs may have important project-specific impacts and requirements." Since the time that the Hanford Groundwater / Vadose Zone Integration Project was formed under the sponsorship of Undersecretary Moniz, the affected Hanford Site activities have worked together to identify common needs. These projects agree on the importance of the needs and that the stress for these activities should be on technology deployment, not on further scientific research.	The TFA understands that at least three Hanford Site projects including the Hanford Groundwater/Vadose Zone Integration Project, the LAW Disposal Project, and SST Closure Project have worked together to identify common needs and have submitted these needs to both the TFA and the SCFA. The TFA recognizes that SCFA has the EM-50 charter and the core technical expertise to address these specific needs and has, therefore, forwarded the needs to SCFA for their consideration. However, the TFA will continue to be an advocate for the sites for the needs that are best addressed by other focus areas and will function as a partner on the projects selected for funding. The TFA further encourages the site to continue to work directly with SCFA to ensure involvement of the user community.
WPI	(B950) A collaborative "guidance document" based on five or more sites does not seem to address the Hanford specific need for physical tests and modeling, especially after Bechtel and PNNL have spent four years studying specifics of Hanford and next steps have already been identified.	The TFA focus is to provide multi-site benefit. Single site needs are more appropriately funded by the Hanford site.
B960	**Reduced Radionuclide Mobility**	
CHG	Focus on getters that have mechanisms other than redox control for ex-tank applications, because these materials tend to result in rapid release in the future when the getter becomes fully oxidized.	The TFA agrees that mechanisms other than redox control need to be emphasized and the intent of the MYTR is to develop getters that continue to function during oxidizing conditions.
WPI	Of the amount of $440K appears to be excessive for writing a letter report on a candidate getter material.	The $440K includes laboratory development and testing which is summarized in the report.

Appendix E – Review Criteria

E.1 Technical Reviews

E.1.1 General Midyear Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

The review panel will assess the relevancy, quality, and progress of the individual projects and provide a written evaluation describing their assessment of the project/task and any specific recommendations on changes or improvements to the project/task. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and

feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (e.g. laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

E.1.2 Project-Specific Technical Review Criteria

(A9175) Tank Integrity Inspection – CNDE Requirements Strategy and Evaluation
Principal Investigator/TIM: Bruce Thompson & Brian Larson (CNDE/ISU)/Mike Terry
Estimated Technical Maturity: Stage 3 – Exploratory Development

Background and Review Objective

TFA has received similar technology needs from Hanford, INEEL, Savannah River, and Oak Ridge requesting technologies to perform inspection of waste tanks. In response to these needs TFA is implementing a technical strategy (Ref. TFA MYTR A9175) to perform an integrated assessment of specific site requirements and applications to further refine the technology needs and identify potential technologies that could address those needs. The objective is to identify shared technology opportunities and discriminate site-specific challenges to support detailed planning of appropriate technical development approaches. TFA is seeking to maximize the benefit of this work by leveraging common investments to support multiple sites wherever possible.

TFA and CMST are drawing on the expertise of the Center for Non Destructive Evaluation (CNDE) to assist in coordinating the review of site needs and requirements and to provide expertise in defining a strategy for selection and development of technologies to address those needs. A series of meetings with representatives of each user organization has been conducted and the results are being documented by the CNDE. TFA is now developing the detailed planning to support executing specific technical scope in response to this technology needs assessment. The TFA Safety TIM will present the overall strategy, of which the CNDE work is an integral part, to provide an overall perspective on the direction of the technical work.

This project review will evaluate the process and outcome of the TFA/CMST/CNDE site needs assessment and requirements review, and the resulting technical strategy that is being proposed as an outcome of this effort. The CNDE evaluation and recommendations, as well as TFA Safety TIM's technical strategy to address the specific site requirements, will be presented to the review panel. The objective of the review is to assess the adequacy and conclusions of the CNDE investigation process and validity of the resulting recommendations/strategy.

The review panel will assess the relevancy, quality, and progress of the CNDE work and overall technical strategy and provide a written evaluation describing their assessment of the work and any specific recommendations on changes or improvements. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator(s)/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end-user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

2. Technical Merit: The proposed work has a high likelihood of providing valid and feasible technical solutions. The technical strategy and methodology is based on sound scientific and

engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Is the technical approach and strategy based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific or engineering community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?
  - Does the strategy take advantage of lessons learned from prior tank inspection activities?

- Is the technical strategy proposed likely to have advantages as an alternative to the existing baseline and/or lead to definition of a sound technical baseline for tank inspection?
  - Is the proposed development program or technology selected likely to meet the site(s) tank inspection requirements?

- Have major decision points and a review strategy been adequately defined?
  - If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- What is your assessment of the current technical maturity of this work/technology? (see reference stage/gate definitions)

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives (see MYTR budget information)?

- Does the proposed approach include developing and assessing cost information needed to support technology evaluation and selection?

- Has the end-user defined specific cost evaluation criteria?
- Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project(s)?
  - Are these being adequately considered in the technical strategy?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?
  - If so, are the responsibilities and actions related to supporting these user led efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization been considered?
  - If they exist, has a plan to deal with these issues been defined?

(A9352) Remote Systems for Pit Operations and Maintenance
Principal Investigator/TIM: Dennis Crass (RPP/NHC), Sharon Bailey (PNNL)/Peter Gibbons
Estimated Technical Maturity: Stage 5 – Engineering Development

Background and Review Objective

Waste retrieved from Hanford Site tanks must pass through a number of valve and pump pits associated with single-shell tanks before delivery to the waste treatment plant. Many of these pits will have to be decontaminated and equipment modified before the waste can be transferred. Current methods for modifying, operating, cleaning and decontaminating these pits are personnel intensive, costly and result in a high dose to workers. Currently, work associated with pits is the single largest contribution to RPP operations dose levels. For example, in support of the recent tank C-106 retrieval preparations, the initial dose rate measured in the 241-C-106 tank valve pits was 40 R/hr. Traditional pit operations conducted manually by operations personnel are very slow and are greatly constrained by limitations imposed by access, shielding, and viewing restrictions. In the case of C-106, after investing $2 million and 9 months of extensive manual operations, the dose rate was reduced to only 20 R/hr. During this campaign, 25 person-rem of dose to operations personnel was accumulated.

The technical strategy for improved remote decontamination, maintenance, and reconfiguration of Hanford pits evolves from the current baseline at Hanford, which is simple but difficult to use in higher radiation level cases. The objective is to determine what remote technology would be useful to the operating crews without requiring excessive upkeep over time. The technology insertion must be in small well-defined steps in order to be successful. The Robotics program will work closely with site operations personnel to define requirements, to develop specifications for procurement from industry, and to support eventual deployment of the system at Hanford.

At Hanford, the Pit maintenance work was started in FY99 with the Robotics program evaluating a number of technical options for Hanford Pits and recommending a fairly simple technical approach. The Hanford River Protection Project (RPP) ultimately agreed upon this approach during the first quarter of FY00, and site funds are being utilized to support the effort as well as TFA funding. TFA, RPP, and cognizant DOE offices approved a Memorandum of Agreement (MOA), which provides that Hanford tank farm operations will supply operators and fund tank farm preparations and deployment through the W314 Project. In FY00, two procurements were placed for the deployment platform and manipulator arm. The deployment platform utilizes a commercial backhoe that will be used for gross positioning of the manipulator and the arm. The manipulator will be used to grasp and manipulate tooling to perform remote operations within the pit. A camera system will provide the operator with viewing capability to support positioning and remote operations. Computer-based modeling and simulation is being done to assist in planning for system integration and testing, as well as to support planning for actual operations.

Principal Investigators from RPP, PNNL, and ORNL are collaborating in the development and testing of this system. ORNL is responsible for development of the viewing system. PNNL is responsible for specification and acquisition of the deployment platform and manipulator, system integration and testing, and assisting RPP in training and field operations. RPP is responsible for defining system requirements, providing technical oversight, and integrating planning with the W314 project for system deployment.

This Gate 5 review will evaluate the proposed remote systems technologies and results of prior development and testing. Plans for system integration, testing, and delivery to the to the Hanford user should be assessed to ensure the project has a sound technical basis and has developed appropriate planning for supporting the project W-314 requirements. The review will focus on readiness of the project to move into full-scale demonstration of the integrated system followed by operator training and turnover to the Hanford W-314 project in FY01 for deployment.

The review panel will assess the relevancy, quality, and progress of the project and provide a written evaluation describing their assessment of the project/task and any specific recommendations on changes or improvements to the project/task. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound

understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end-user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Is the technical strategy based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?

- Is the technical strategy proposed likely to have advantages as an alternative to the existing baseline technology and/or lead to definition of a sound technical baseline?

- Is the proposed experimental program likely to provide adequate technical data to address technical uncertainties and provide sound recommendations?
  - If not, what additional experimentation or data requirements need to be added to strengthen the results?

- Have major decision points and a review strategy been adequately defined?

- If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- Is the project ready to move from Stage 5 (Engineering Development) to Stage 6 (Demonstration)? (See reference stage/gate definitions)
  - If not, what additional work is needed to complete the Gate 5 transition?

- Are the proposed facilities in which the experimental/development work will be conducted adequate to support the technical requirements and objectives?
  - If not, what alternatives or suggested improvements can be incorporated into the project planning?
  - Are there specific limitations on the facility that may impact the results?

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives?

- Is the project developing and assessing cost information needed to support technology evaluation and selection?
  - Has the end-user defined specific cost evaluation criteria?
  - Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project?
  - Are these currently being adequately considered in the project?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?

- If so, are the responsibilities and actions related to supporting these user-lead efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization issues been considered? If they exist, has a plan to deal with these issues been defined?

(A9508) Decontamination Process Waste Volume Reduction
Principal Investigator/TIM: Rick Demmer (INEEL)/Phil McGinnis (TFA)
Estimated Technical Maturity: Stage 6 - Demonstration

Background and Review Objective

DOE-ID and the State of Idaho have entered into an agreement to cease use of high-level liquid waste storage tanks at the Idaho Nuclear Technology and Engineering Center (INTEC) by 2012. In response, DOE-ID has established goals to cease liquid additions by ~2005 and is requiring INTEC to minimize the volume of wastes going to the tanks as a precursor to closing the tanks. A significant volume of newly generated waste is produced by decontamination processes, laboratory chemical analysis and from treating spent HEPA filters. INEEL initiated investigation of commercial processes to reduce waste generation and additional TFA-funded efforts to develop/utilize processes that reduce the volume of waste generation were started during FY00. The basic approach is to utilize more efficient decontamination technologies and alternative operating techniques to reduce wastes from analytical laboratories and filter treatment. Problem areas were identified in two FY99 reports, INEEL/EXT 99-00133, Minimization of Corrosive Chemicals (including decontamination wastes) and INEEL/EXT 99-00664 Reduction of INTEC Analytical Radioactive Liquid Waste.

Commercially available industrial and laboratory scale processes that generate significantly less quantities of waste, yet fulfill operational requirements are being investigated as replacement methods to those currently used. Industrial vendors are being interviewed for the capabilities they may be able to offer. Demonstrations of technologies will be applied to actual wastes on-site. Alternative operating techniques will also be investigated. In FY01, the project will complete identification and evaluation of industrial capabilities and technologies for decontamination of process equipment and tanks with minimal waste volume generation. The project will recommend technologies for further testing and development.

A new decontamination method, the Siemen's HP/CORD low waste process is being tested and evaluated. In FY01, the project will conduct a radioactive demonstration of HP/CORD decontamination process on INTEC equipment components. Depending on results from this demonstration, specifications for new equipment for FY02 deployment will be prepared.

New decontamination methods from Russia will be evaluated under a contract with the Bochvar Institute (VNIINM) in Moscow. Included are a novel strippable coating and an electrochemical technique coupled with an ion exchange system to minimize liquid waste volume. In FY01, the project will complete evaluation of Russian decontamination methods.

Two technologies to minimize waste from treating HEPA filters are being tested: 1) a new, non-liquid technique for direct stabilization of the HEPA filter media, and 2) further modification of the current filter leach process (pulp processing) to be more efficient with respect to liquid waste generation. In FY01, work will continue with Argonne National Laboratories-West to investigate alternative methods for HEPA filter stabilization including

direct vitrification and other chemical stabilization methods. The project will provide information and recommend selection of alternative process(es) for spent HEPA filter processing.

The project review will evaluate the technology screening, selection and testing work performed to date. The objective is to review the technical results, assess the feasibility of implementing the proposed technologies, and evaluate whether the approach and results are leading to appropriate recommendations to address this high-priority INEEL site need. The review panel will evaluate whether the work appears to be progressing such that INEEL will be able to meet DOE-ID waste minimization goals and state commitment drivers.

The review panel will assess the relevancy, quality, and progress of the project and provide a written evaluation describing their assessment of the project/tasks and any specific recommendations on changes or improvements to the project/tasks. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end-user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Is the project scope based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?

- Is the technical strategy proposed likely to have advantages as an alternative to the existing baseline technology and/or lead to definition of a sound technical baseline?

- Is the proposed experimental program likely to provide adequate technical data to address technical uncertainties and provide sound recommendations?
  - If not, what additional experimentation or data requirements need to be added to strengthen the results?

- Have major decision points and a review strategy been adequately defined?
  - If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- What is your assessment of the current technical maturity of this work/technology? (See reference stage/gate definitions)

- Are the proposed facilities in which the experimental/development work will be conducted adequate to support the technical requirements and objectives?
  - If not, what alternatives or suggested improvements can be incorporated into the project planning?
  - Are there specific limitations on the facility that may impact the results?

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives?

- Is the project developing and assessing cost information needed to support technology evaluation and selection?
  - Has the end-user defined specific cost evaluation criteria?
  - Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project?
  - Are these currently being adequately considered in the project?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?
  - If so, are the responsibilities and actions related to supporting these user-lead efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization issues been considered? If they exist, has a plan to deal with these issues been defined?

(A9768b) DWPF Melter Improvements – Pour Spout
Principal Investigator/TIM: Denny Bickford (WSRC)/Bill Holtzscheiter (TFA)
Estimated Technical Maturity: Stage 5 – Engineering Development [Note: This review is a Gate 5 Review evaluating readiness to proceed to Stage 6 – Demonstration]

Background and Review Objective

The Savannah River Site's Defense Waste Processing Facility (DWPF) has been operating for a number of years and has identified opportunities to improve the vitrification process design and to improve the glass melter design. Changes to the configuration of the melter pour spout are required to stabilize glass-pouring behavior. There is a need to prevent a phenomenon called "wicking" where the glass adheres to the wall of the pour spout rather than dropping directly into the canister and to accommodate changes in glass flow resulting from spout wear. This has resulted in significant pluggage of the pour spout and lower glass production rates versus design. Current work is focused on the DWPF pouring issues related to pour spout configuration (knife edges, heater locations, temperature, etc.). In addition to design modifications, changes in feed conditioning may also contribute to improvements in pouring, since there is evidence that the current melt is aggressive to the pour spout materials of construction.

Design changes have been proposed to improve the design of the DWPF melter pour spout. In addition to physical design changes, modifications to materials of construction will also be evaluated to reduce the impact of corrosion/erosion. Candidates for both the pour spout and the insert include coatings and material changes such as platinum and ceramics. Material modifications are currently being made to the bellows liner to reduce the tendency for the glass to collect in that area. The plan is to continue utilizing both the Florida International University (FIU) small melter designed to understand flow dynamics and the Clemson University large-scale melter facilities to test actual design options (including inserts and configurations for next generation melters). The impact of the Argon purge will be evaluated (it is currently not functional in the DWPF melter-1).

Limited hot testing of one modification design to the pour spout was tested in DWPF in FY00 and technical issues with performance of the modified design were encountered. Lessons learned are being evaluated and incorporated into continued development and testing. Results of these tests indicated further work and refinement of the modifications would be required for improved operation.

This Gate 5 review will assess the process and results of prior development and testing. Results of testing performed at the Clemson and FIU small melter facilities as well as results of DWPF melter insert testing will be presented. The review should assess the need for further development and small-scale testing based on results to date. Plans for installation of modified pour spout inserts into the DWPF melter should be evaluated against requirements and expectations for SRS user acceptance to determine readiness of the project to move into full-scale hot demonstration and operations.

The review panel will assess the relevancy, quality, and progress of the project and provide a written evaluation describing their assessment of the project/task and any specific recommendations on changes or improvements to the project/task. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

- Has the DWPF user reviewed the results and accepted the proposed modifications for installation and hot testing in the melter?
  - If not, why and what is needed to meet their acceptance requirements?

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Are the proposed DWPF design changes based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?
  - Have similar operational issues been encountered in U.S. or foreign melters, and if so have lessons learned been evaluated to benefit this project?

- Is the technical strategy proposed likely to result in an improved DWPF melter pour spout design that can be implemented in the plant?

- Is the proposed experimental program likely to provide adequate technical data to address technical uncertainties and provide sound recommendations?
  - If not, what additional experimentation or data requirements need to be added to strengthen the results?

- Have major decision points and a review/acceptance strategy involving DWPF users been adequately defined?
  - If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- Is the project ready to move from Stage 5 (Engineering Development) to Stage 6 (Demonstration)? (See reference stage/gate definitions)
  - If not, what additional work is needed to complete the Gate 5 transition?

- Are the proposed facilities in which the experimental/development work will be conducted adequate to support the technical requirements and objectives?
  - If not, what alternatives or suggested improvements can be incorporated into the [project/task] planning?
  - Are there specific limitations on the facility that may impact the results?

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives?

- Is the project and/or end user developing and assessing cost information needed to support technology evaluation and selection?
  - Has the end-user defined specific cost evaluation criteria?
  - Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project?
  - Are these currently being adequately considered in the project?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?
  - If so, are the responsibilities and actions related to supporting these user-lead efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization issues been considered? If they exist, has a plan to deal with these issues been defined?

(A9768a) INEEL Melter Development
Principal Investigator/TIM: Chris Musick (INEEL), Doug Witt (WSRC)/ Bill Holtzscheiter
Estimated Technical Maturity: Stage 3 – Exploratory Development

Background and Review Objective

INEEL is in the early stages of investigating vitrification as the baseline treatment method for both liquid sodium-bearing waste (SBW) currently stored in the underground waste tanks and dry calcine waste stored in above-ground bins. DOE-ID has an agreement with the State of Idaho that specifies dates, which drive the treatment schedule for these waste streams. By 2012, the remaining liquids in the INTEC waste tanks must be removed, which drives the treatment schedule for SBW. By 2035, all waste must be road-ready, which drives the treatment schedule for the calcine waste. DOE-ID expects to recommend vitrification treatment of both waste streams as the preferred treatment method in the upcoming record of decision.

TFA is funding development and testing work to support recommendations on melter technology appropriate for treatment of the SBW and calcine. Melter tests with INEEL simulated feeds will be performed to develop operating limits on salt and rare earth species to resolve phase stability and melt rate concerns under continuous operations. Criteria transferring INEEL feed to a melter and for melter performance (corrosion, melt rate, etc.) will be developed. Higher temperature melts, possibly up to 1500°C, will be evaluated with particular emphasis on volatility. Testing of glasses formulated for higher temperature melters will be arranged with particular attention toward coordination with strategic task AA7S2 *New Melter Technology*.

SRTC will provide technical staff to support continuous operation of the melters to accomplish the test objectives in this task. Where possible, cognizant staff involved in the program and trained on the equipment will supplement the SRTC technical support (e.g. INEEL, FIU, and PNNL principal investigators). Test or experimental plans will be prepared (by INEEL) for each melter run and reviewed by the non-lead members of the technical team.

For application to Idaho waste streams, the glass chemistry work in TFA Task A9773 *Improve Waste Loading in High Level Waste Glass* will be integrated with this task to ensure materials compatibility and to define performance requirements. INEEL has done extensive work on evaporation of various combinations of Idaho waste streams and a combination of literature, national, international, and on-going research (e.g. flowsheet development for Hanford) will be leveraged to address this user need. Similarly, previous work has been performed by PNNL and INEEL in FY98 on technical options for denitration of INEEL waste streams, which is applicable to this task. Functional tests of proposed INEEL melter feeds will be conducted including feed handling, pilot scale melting and offgas characterization. The initial INEEL work will focus on gaining experience with the individual calcines and SBW and identifying processing issues associated with zirconium, phosphate, and nitrate levels.

This review will evaluate the progress to date in implementing a melter development strategy leading to defining a sound baseline for vitrification of both SBW and Calcine waste. The review panel will assess whether this strategy is based on sound technical assumptions and is leading to appropriate and timely recommendations to support INEEL site needs and schedules. The review will assess the feasibility of the technical strategy to address the needs, quality and validity of results to date, and whether the planned work should meet the schedule drivers per DOE agreements with the State of Idaho for treatment of the SBW and calcine waste. [Note: Work on development of glass formulations for INEEL was peer reviewed by ASME in 9/00 and it not in the scope of this review; this presentation is intended to provide supporting information on work that is closely related to the melter development work.]

The review panel will assess the relevancy, quality, and progress of the project and provide a written evaluation describing their assessment of the project/tasks and any specific recommendations on changes or improvements to the project/tasks. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end-user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Is the technical strategy and project work based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?
  - Is relevant vitrification experience from DOE and international waste treatment programs being adequately examined for lessons learned to benefit this project?

- Is the technical strategy and project work to date consistent with the INEEL development roadmap(s) and is it likely lead to a sound vitrification baseline?

- Is the proposed experimental program likely to provide adequate technical data to address technical uncertainties and provide sound recommendations?
  - If not, what additional experimentation or data requirements need to be added to strengthen the results?

- Have major decision points and a review strategy been adequately defined?

- If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- What is your assessment of the current technical maturity of this work/technology? (see reference stage/gate definitions)

- Are the proposed facilities in which the experimental/development work will be conducted adequate to support the technical requirements and objectives?
  - If not, what alternatives or suggested improvements can be incorporated into the [project/task] planning?
  - Are there specific limitations on the facility that may impact the results?

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives?

- Is the project developing and assessing cost information needed to support technology evaluation and selection?
  - Has the end-user defined specific cost evaluation criteria?
  - Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project?
  - Are these currently being adequately considered in the [project/task]?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?

- If so, are the responsibilities and actions related to supporting these user-lead efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities). The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization issues been considered? If they exist, has a plan to deal with these issues been defined?

(A9777) – Remote Disassembly of HLW Melters & Other Processing Equipment
Principal Investigator/TIM: Denny Bickford, Mike Smith (WSRC)/
Bill Holtzscheiter (TFA)
Estimated Technical Maturity: Stage 3 – Exploratory Development

Background and Review Objective

This project addresses the need to size reduce, decontaminate, classify, and dispose of large failed highly contaminated processing equipment including HLW melters, processing vessels, jumpers, etc.

The approach will be to develop techniques that are compatible with remote operations either in a large shielded cell or in a portion of a "canyon" building monitored by video. The first task will be to demonstrate techniques suitable for removing HLW glass from a failed melter compatible with either recycling into a process step or, if glass can be shown to be acceptable, loaded directly into a HLW canister which could either be welded closed or further filled with molten glass. Since glass has been removed from test and radioactive melters, technology used for those tasks will be evaluated for applicability or adaptation to remote operations. A strategy for segregating/removing glass in the melter, sampling, and analysis will be developed to support disposal as HLW either directly into canisters or via reprocessing through another melter. The recommended process will be demonstrated on a non-radioactive, pilot-scale or full-scale melter. From that demonstration, recommended specifications for systems to be used at HLW processing facilities will be prepared. A plan will be developed to identify the paths for disposal for all of the waste resulting from the glass removal, cutting and size reductions.

The second task is to determine the technical, operational, and regulatory requirements for size reduction, decontamination, sorting, and disposal of failed process equipment and process vessels. Once the approach and equipment have been identified, a demonstration of the technologies will be performed. Recommended specifications for systems to be used at HLW processing facilities will be prepared. This second task also benefits from experience and lessons learned from the ongoing deployment of technologies under the Vitrification Expended Material Processing (VEMP) System (ASTD funded project), which is being utilized to segregate, size reduce, and package various materials and equipment generated during the vitrification of high-level waste (HLW) at the West Valley Demonstration Project (WVDP).

This project is being performed collaboratively by West Valley, Savannah River, and ORNL. The project is funded through TFA in collaboration with the Robotics Crosscutting Program. West Valley has the overall lead for the project, as well as the lead for the size reduction task and integration with the VEMP project. Savannah River has the lead for the glass removal methods task. Robotics program expertise from ORNL is being applied to select and specify equipment and is applying expertise from other remote D&D projects.

The project review will focus on results and recommendations from initial investigations of glass removal methods. The review will also evaluate the limited work to date and future

plans for the second task on size reduction, decontamination, sorting, and disposal of failed process equipment and vessels. Specific evaluation of the VEMP project is out of scope for this review, except as the experience and lessons learned apply to the first and second tasks described above. As this task has only been underway for less than one year, planned work and future activities to integrate with site projects should be an important part of the review panel's evaluation.

The review panel will assess the relevancy, quality, and progress of the project and provide a written evaluation describing their assessment of the project/tasks and any specific recommendations on changes or improvements to the project/tasks. TFA will use the results of the review to recognize outstanding performance, support future planning, and to identify any needed corrective actions.

Review Criteria

The Tanks Focus Area (TFA) is committed to tracking technical progress and maturity of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic technical progress and gate reviews are conducted to evaluate the ongoing work in the following areas:

- Relevancy to User needs and requirements
- Technical merit and maturity progression
- Cost effectiveness of the proposed solution
- ES&H risk evaluation and mitigation
- Solution viability and delivery

Projects undergoing technical progress and gate reviews at the TFA FY 2001 Midyear Review will be expected to address these areas in their presentations and discussions with the review panel. Relevancy to user needs and technical merit will be the primary focus of the Midyear Review presentations and discussions, however the presenter(s) should cover the other topics in sufficient detail to communicate an understanding of the project specific issues and indicate the planned project activities or strategies for addressing these areas.

Five review criteria and suggested criteria-specific questions are provided below for consideration of the review panel.

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach is based on a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Has the Principal Investigator/TIM clearly articulated an understanding of the user need(s) that are being addressed by this project?

- Have end-user performance requirements been identified, documented, and incorporated into the technical strategy and project planning?

- Can the work defined in the technical strategy be completed in a timeframe consistent with the user need schedule?

- Is there evidence of site/user involvement in the definition and implementation of the technical strategy and/or project plan?

2. Technical Merit: The proposed work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Suggested questions for consideration during review preparation and discussions:

- Is the technical strategy based on well-founded assumptions and has a scientifically based, technically viable program been proposed?
  - If not, what assumptions should be reassessed?
  - What improvements could be suggested in the scientific/technical basis of the proposed work?
  - What are the potential significant technical gaps in the proposed approach?

- Does the proposed work consider relevant technical work in the scientific community and published literature?
  - If not, are there suggested source materials/experts the principal investigator(s) should access?

- Is the technical strategy proposed likely to have advantages as an alternative to the existing baseline technology and/or lead to definition of a sound technical baseline?

- Is the proposed experimental program likely to provide adequate technical data to address technical uncertainties and provide sound recommendations?
- If not, what additional experimentation or data requirements need to be added to strengthen the results?

- Have major decision points and a review strategy been adequately defined?
  - If not, are there specific recommendations on the approach for assessing the technical progress and feasibility of the work?

- What is your assessment of the current technical maturity of this work/technology? (See reference stage/gate definitions)

- Are the proposed facilities in which the experimental/development work will be conducted adequate to support the technical requirements and objectives?

- If not, what alternatives or suggested improvements can be incorporated into the [project/task] planning?
- Are there specific limitations on the facility that may impact the results?

3. Cost: Cost effectiveness of the technical development/demonstration program and implementation of the technical solution are a critical factor in evaluating the viability and feasibility of a proposed technical solution. Appropriate planning and analysis of costs must be included in the technical program. Analysis of costs against specific user criteria should be included in the overall evaluation of the performance of a technical solution.

Suggested questions for consideration during review preparation and discussions:

- Is the budget for the proposed research reasonable to achieve the defined objectives?

- Is the project developing and assessing cost information needed to support technology evaluation and selection?
  - Has the end-user defined specific cost evaluation criteria?
  - Has a basis for cost evaluation and comparisons been presented?

4. Safety, Health, Environmental Protection, and Risk: Human health and ecological risks are important factors in the evaluation of a technical solution. Risks must be considered both in the conduct of the technical program and in the ultimate implementation of the technical solution. Occupational safety of the technology developers and end user of the technology should be carefully evaluated and planned as part of the technical program. Appropriate planning by the development team and involvement of end users in these evaluations is critical to the ultimate viability and feasibility of the technical solution.

Suggested questions for consideration during review preparation and discussions:

- Are there major ES&H risk factors that should be considered in the performance of the development program and in the implementation of the technical solution?
  - If so, what specific risks should be addressed in the planning and execution of the project?
  - Are these currently being adequately considered in the [project/task]?

- Are there significant interfaces with end-user programs and organizations responsible for ES&H reviews and analyses that should be considered?
  - If so, are the responsibilities and actions related to supporting these user-lead efforts defined and planned?

- Are there specific occupational safety risks that need to be considered both as it relates to the conduct of the experimental/development program and with respect to requirements for field implementation of the proposed technical solution?

5. Solution Viability: The proposed technical program will likely result in a viable technical solution that can be delivered by industry or other DOE providers (laboratories, universities).

The development program has established adequate planning for the management of intellectual property with appropriate consideration of DOE interests in the use and application of the technology/technical solution. Qualified performers have been selected to conduct the work and involvement of labs, universities, and industry is encouraged as appropriate to the nature of the technical program.

Suggested questions for consideration during review preparation and discussions:

- Have appropriate and qualified performers been selected to conduct the program?
  - Are there specific recommendations on performer selection or makeup of the project team?
  - Has involvement of appropriate experts from industry, universities or national laboratories been considered in defining the technical approach?

- Is there a plan to ensure a viable technology provider or vendor for the technology will be available?

- Have potential issues with intellectual property, proprietary information, or commercialization issues been considered? If they exist, has a plan to deal with these issues been defined?

E.2 Status Reviews

The Tanks Focus Area (TFA) is committed to tracking progress of technology development projects/tasks to ensure they are achieving technical and programmatic goals required to deliver technical solutions to user needs. Periodic progress reviews are performed to determine the status of technical work and ensure the project is on schedule to complete planned work and deliverables. These project status reviews provide an opportunity to share results of work to date with the broader TFA user community and for early identification and resolution of technical or programmatic issues.

Continuing or new projects undergoing status reviews at the TFA FY 2001 Midyear Review will be expected to present a general overview of the project objectives, discuss relevance to user needs, and summarize planned work, progress to date and major accomplishments. Presenters should use this opportunity to also identify any technical or programmatic issues that could impede progress or threaten meeting scheduled commitments. Projects at or nearing completion should focus on the results and benefits of the work, lessons learned, and opportunities for transfer of technology and experience to other sites and applications.

Relevancy to user needs and technical merit will be the primary focus of these Midyear Review presentations and discussions. The review panel will evaluate the materials presented and as they deem appropriate offer commentary and suggestions to TFA to help in guiding the progress and direction of the technical work.

Review Criteria

1. User Need/Involvement/Requirements: The project/task addresses specific, high-priority need(s) defined by the TFA User community. The approach reflects a sound understanding of applicable requirements. The end user supports the technical program and is actively involved in the definition, development, and ultimate use of the technical solution.

2. Technical Merit: The work has a high likelihood of providing a valid and feasible technical solution. The technical strategy and methodology is based on sound scientific and engineering principles. Technical progress is being demonstrated and periodically evaluated through appropriate assessment methods (e.g. technical reviews, peer reviewed publications, demonstrations, analyses).

Appendix F – Midyear Review Meeting Comments/Recommendations and TFA Responses

F.1 Technical Reviews

(A9175) Tank Integrity Inspection Techniques – Center for Nondestructive Evaluation (CNDE) Requirements Strategy and Evaluation

Technical Advisory Group (TAG) Review Comments/Recommendations and Tanks Focus Area (TFA) Responses

TFA has received similar technology needs from Hanford, Idaho National Engineering and Environmental Laboratory (INEEL), Savannah River Site (SRS), and Oak Ridge Reservation (ORR) requesting technologies to perform inspection of waste tanks. TFA seeks an integrated assessment of specific site requirements and application to refine the technology needs and identify potential technologies to address these needs. The objective is to identify shared technical opportunities to maximize the benefit of the work by leveraging common investments to support multiple sites whenever possible.

Towards this effort TFA and Characterization, Monitoring, and Sensor Technology Cross Cutting Program (CMST) has engaged the CNDE to assist in the review of site needs and requirements and to provide expertise to define a strategy to select and develop technologies to address those needs.

Products of this activity are the 1st Annual Tank Integrity Workshop, Compendium of Tank Integrity Activities, and identification of major tasks and activities. The Review Team received the proceedings of the workshop and the compendium of tank integrity activities prior to the meeting. The presentation at the Midyear review included an overview of the project by the Safety Technology Integration Manager (TIM) Mike Terry; an overview of the CNDE, the outcome of the Workshop, and summary of Compendium of Tank Integrity Activities by the CNDE Director Dr. Bruce Thompson; and an outline of descriptions to proposed projects to pursue by CNDE Project Manager Brian Larson.

The Review Team confines evaluation to these activities. Also, since these activities are the beginning of a project and not an evaluation of activities in progress the Team will not follow the outline suggested by TFA but provides findings and recommendations.

Findings of the Review Team

1. General Evaluation

   The Workshop and Compendium of Tank Integrities Activities was quite successful in fostering communications amongst personnel at the sites (Hanford, SRS, INEEL, West Valley Demonstration Project [WVDP], ORR, DOE Laboratories (Sandia, Ames), Fernald, and Universities (Florida International University [FIU], Mississippi [MSU]).

Common problems were identified, and the approach to identify and develop solutions to these problems appears on track. In general these solutions should be pursued. Although a large number of participants attended the workshop, more U.S. Department of Energy (DOE) site personnel should be invited at future workshops.

To assure the success of the CNDE activities, continuous guidance and monitoring by the TIM is required.

TFA Response: We concur that more DOE site personnel would be beneficial at future workshops. A considerable effort went into identifying potential contributors to the workshop and encouraging attendance. However, the number of DOE site personnel identified was relatively small and it was unfortunate that more of those who were invited were not able to attend. For future workshops, multiple DOE personnel from each site will be invited to participate.

The Safety TIM and CMST lead have provided much guidance and assistance in the start-up phase of the CNDE activities. Their direction and contributions have greatly assisted CNDE in quickly becoming familiar with a variety of nondestructive evaluation (NDE) related issues across the DOE complex. CNDE welcomes continued guidance from TFA and CMST.

2. Guidelines for Structural Integrity Program

The Brookhaven National Laboratory (BNL) guidelines (issued as DOE 435.1G) for development of structural integrity programs for DOE high-level storage tanks are generally considered to be a good foundation for implementing DOE Order 435.1. This order specifies requirements for (a) design for structural integrity, and (b) development of structural integrity programs for tanks and piping. Concerns were expressed that the BNL document does not meet all the needs of the sites, that some guidelines cannot be met, and that about ten percent of the material is outdated. A recommendation for revision of these guidelines is proposed.

The Review Team recommends that the task of revising the BNL guidelines report, if done, should be limited to updating the estimated 10% of outdated material. This effort could be sponsored by TFA. Caution is advised that such a revision not evolve into a significant effort from CNDE and deflect the contracted services of CNDE from the technical tasks. One suggestion is to use an independent standards body instead of CNDE such as the American Society of Mechanical Engineers (ASME) to provide an independent review, objectivity, and integrity.

There was much discussion and dissenting views amongst the Review Team on this issue. The Review Team views pursuing this activity as a TFA policy decision as it sets a precedent for TFA.

TFA Response: We concur that this is a TFA policy decision. It is not necessary that CNDE should play a major role in this activity. It should be noted, however, that it seems

timely to work on this revision. The update was a priority item identified at the workshop and there are a number of potentially key individuals that are currently interested in working on the document. Some of these individuals, such as Dave Cowfer and Ben Cross, may not be available to assist in this effort if its start is delayed for too long, since they are in various stages of retirement. Loss of corporate memory is a concern in whatever policy is adopted. The TFA TIM will pursue follow-on discussions with TFA Management to evaluate the timing and appropriateness of this effort in light of program priorities and funding availability. As appropriate additional scope in FY 2001 or FY 2002 may be added to the task, if a consensus on funding this under TFA is reached.

3. Major Tasks and Activities

A set of six high-priority tasks and five medium-to-low priority tasks were identified for TFA approval for CNDE projects addressing multiple site needs.

The Review Team judges that this list is not all-inclusive. The Review Team concludes that the CNDE is moving too rapidly and should spend more time to ascertain that correct needs have been identified.

An example of a potential need not on the list is a method to monitor and quantify leaks during tank operation (sluicing, mixing, transferring, etc).

TFA Response: We concur that the list is not all-inclusive. We rely on the primary contacts at each of the sites to make us aware of their needs. These contacts are believed to be in positions with visibility to the tank inspection and monitoring needs of the site. Information is solicited from each of the contacts at least every three months during coordination conference calls.

Ascertaining the overall importance of the identified tasks is difficult for CNDE to do, however as part of the normal TFA multi-year technical response development and review by site users there is an opportunity to ensure proposed work is consistent with site needs and priorities. The needs of the sites seem to be very dynamic, with new needs surfacing and some needs becoming seemingly unimportant from month to month. Therefore, the approach taken has been to identify needs that CNDE believes it can address and that have potential for application at multiple sites. For example, Hanford has expressed a need to assess the condition of the concrete domes of the tanks. CNDE is pursuing the development of an ultrasonic technique that, if successful in making this assessment, would likely find utility at other sites for many years to come. Similarly, SRS has expressed an interest in a remote measurement technique that would provide information on the microstructure of the steel used in their tanks. The information would contribute to assigning a level of fracture toughness to the material and improve confidence in the damage tolerance analysis of the tanks. CNDE has extensive experience with ultrasonic and magnetic measurement techniques that can produce data that is useful in characterizing microstructure. If the initial measurements on the SRS material are successful, it is expected that other sites will find the technique useful.

Communications with site representatives are ongoing and future workshops to update and add to information developed in FY 2001 are planned. Close communication with the TFA Safety TIM provides the benefit of providing information on evolving needs and requirements based on recent interface with the site user community. With this in mind, CNDE would like to continue using its current procedure and interact with both TFA management and the TFA TAG periodically to ensure work is progressing and in proper alignment with site requirements. TFA suggests it would be appropriate to revisit the progress and direction of this work at the FY 2002 midyear review, if deemed appropriate by management at that time.

4. New Technology Needs

The tasks identified above are based on existing technology needs. The task descriptions will bring some new instrumental techniques and procedures to address the existing problems. However, new technology needs have not been defined, and the Review Team recommends that efforts be made to define such needs and suggest approaches to the solutions.

An example of a need for new technology is the capability to locate cracks below fluid levels in subterranean single-shell tanks.

TFA Response: We concur that new technology needs should be discussed and identified. These new-technology needs would then need to be prioritized with the existing-technology needs and a decision made as to where resources should be expended. It is possible that some of the technology currently being explored by CNDE will lead to new-technology development. Specific to the example cited above, electromagnetic acoustic transducer technology is currently being explored to make thickness measurements on tank walls covered with scale. This technology may lead to a method of locating cracks and corrosion damage below the fluid level in single-shell tanks that does not require extensive surface cleaning/preparation of the tank wall. Although being developed specifically to enhance inspection capability of the lower knuckle of Hanford double-shelled tanks (DSTs), the Pacific Northwest National Laboratory (PNNL) Synthetic Aperture Focusing Technique (SAFT)/Tandem Synthetic Aperture Focusing Technique (TSAFT) technology may provide additional capability to interrogate tank walls below the level of the liquid or solid materials from within the tank-ideal for single-shelled tanks (SSTs).

5. Cost Effectiveness of Project

It is too early into this project life to assess the cost effectiveness of the project.

Recommendations of the Review Team

1. Consideration should be given to developing risk-based methodologies to assess continued operations of tanks and pipe lines with potential or existing defects. This is an area heavily plowed in industry and could prove valuable for DOE.

TFA Response: We concur that a risk-based approach should be considered. This was discussed at the workshop in Atlanta and advocated by some of the participants. In addition, Martin Edelson of the Ames Laboratory is involved in a working group examining risk-based approaches in the broader context of Office of Environmental Management (EM) activities throughout the complex. Action on this item would depend somewhat on the TFA policy decisions made with respect to revising the "Guidelines for Structural Integrity Program," DOE 435.1G, as discussed in Finding 2 above. Should TFA support revision of the guidance document, strong consideration will be given to inclusion of a risk-based methodology for tank and associated equipment in the suggested revisions.

2. Consideration should be given for risk-based assessment of the degree of examination of tanks to determine their integrity status. Methodologies to employ include sampling theory, statistical analysis of life expectation, safety risks to personnel and environment. Again, substantial work has been done in industry on this methodology.

   TFA Response: This is closely coupled to the recommendation above and involves an implementation of that methodology. Details of a response depend on the policy issue noted above.

3. DOE/TFA should consider membership to CNDE. Benefits include exposure to similar industrial problems/needs and a potential response of industrial knowledge and expertise to impact on DOE tank integrity problems.

   TFA Response: CNDE would welcome DOE/TFA membership and we concur with the benefits noted. TFA will investigate requirements/costs of membership for the Safety TIM. A proposal to TFA management on whether to pursue this membership will be made this fiscal year for planning of FY 2002 budget for the TIM.

User Review Comments/Recommendations and TFA Responses

UF_6 cylinders were listed as a need from ORR. This is not a tank need and should not be a consideration for TFA.

TFA Response: The TFA is aware - the cylinders were addressed for completeness. Mike Taylor, Manager for the UF_6 Cylinders Project, participated in the pre-workshop site visit and expressed an interest in non-destructive examination technology.

(A9352) Remote Systems for Pit Operations and Maintenance – Hanford Pit Operations Enhancements

TAG Review Comments/Recommendations and TFA Responses

The review team confirmed that this project has fulfilled the requirements for Gate 5. Further, the team unanimously supports and applauds the forward thinking and actions taken to assure a seamless and effective transfer of capability from the developers to the users. This project, if successful through the deployment stage, will provide an excellent model for effective use of EM-50 resources to solve user needs. It will have effectively bridged the "valley of death" that had been the bane of early EM-50 development efforts.

A team of TAG members, supported by subject matter experts, conducted a Gate 5 review of the subject project at the Salt Lake City Hilton on March 14, 2001. Review team members included Jimmy Bell, Bob Erdmann, Joe Gentilucci, Bill Hamel, John Roecker, Frank Wolley, Tom Weber, and Paul Scott (lead). The review was based on several documents provided by the TFA, and was substantially supplemented by the presentation given by the principal investigator, Sharon Bailey of PNNL.

As a Gate 5 review, this project must meet the following requirements, which define the qualifications to enter the demonstration stage:

- DOE deployment schedule established

- Completed and documented preliminary test results and satisfied test plan requirements

- Principal Investigator (PI) addresses gate programmatic driver criteria, including:
  - End-user need
  - Technical merit
  - Costs
  - Safety, health, environmental protection, risk
  - Stakeholder/regulator/tribal considerations
  - Commercial viability

These requirements were translated to five criteria as specific considerations that the review team used for this review:

1. Relevancy to user needs and requirements
2. Technical merit and maturity progression
3. Cost effectiveness of the proposed solution
4. Environmental, safety, and health (ES&H) risk evaluation and mitigation
5. Solution viability and delivery

Waste retrieval operations at Hanford require personnel intensive work in contaminated valve and pump pits. This results in high costs and high dose to workers. This project involves the development of capability to conduct the most dose-intensive pit operations

remotely. The technology couples a commercial backhoe to a dexterous manipulator in the pit, which will be operated remotely using up to four cameras for vision. The project is jointly funded and supported by TFA and the W-314 Project within the Office of River Protection (ORP) at Hanford.

Findings of the Review Team

1. Relevancy to User Needs and Requirements

The user's needs are described in several documents, but are best defined in the Introduction to PNNL-13046, "Remote Pit Operation Enhancement System: Concept Selection Method and Evaluation Criteria", December, 1999. The user's needs can best be stated as quoted from PNNL-13046 as follows: "current methods for modifying, operating, cleaning, and decontaminating these pits are labor intensive, costly, and result in a high dose to workers. Currently, work associated with pits is the single largest contributor to the River Protection Project (RPP) operations dose levels. For example, the dose in the 241-C-106 pit was 40R/hr. After investing $2M and 5 months, the dose had been reduced to only 20 R/hr. During the pit operations, 25 person-rems were accumulated." Clearly, a less labor and exposure intensive method to conduct pit operations addresses an important need at Hanford.

The end-user's functions and requirements are well documented and incorporated into the project. Again, PNNL-13046 documents these requirements at the top level. These requirements have been subsequently incorporated in lower tier documents such as the procurement specifications for the backhoe and the robotic arm. It is evident from the documentation and the presentation that considerable thought has been given to the development of these requirements.

The user's need schedule for this enhancement to pit operations is one of a continuing and long-term nature. Tank Farm Project W-314 has been designated as the first and prime user of this technology project. Project W-314 is a construction project to clean out and upgrade SST pits for future waste retrieval operations. Project W-314 has initiated construction work. However, with approximately 600 SST pits requiring work, deployment of this project anytime over the next year would be considered timely. In fact, with such a long term need as Project W-314, and other subsequent tank farm operations, consideration should be given to maintaining the TFA project at some level of support so that lessons learned from field operations can be incorporated into future systems as they are procured.

The end user is deeply involved in the TFA project. The following are examples of user involvement and commitment:

1. The user's Vice President for Tank Farm Operations has personally reviewed the project and has given his "go-ahead" to the project in the field.

2. A comprehensive Memorandum of Agreement (MOA) delineating roles and responsibilities between user and developer organizations (both contractor and government) has been prepared and approved. The MOA is an excellent model for adaptation by other TFA projects.

3. The user has prepared a comprehensive deployment plan. Again, this plan could be used as a model for other TFA projects.

The examples of user involvement described also speak to the extent of satisfaction of the user with the TFA project. The approval and commitment on the part of the VP of Tank Farm operations is considered key here. If the user were not satisfied that the project would meet the user's needs and requirements, there would be no such commitment and approval.

The project is to be commended for fulfilling a critical operations need, accomplishing the task in a timely manner, obtaining important and valuable user involvement, and securing the user's senior management commitment and approval.

2. Technical Merit and Maturity Progression

The Pit Viper is a straightforward application of off-the-shelf technology. It is capitalizing on the technical capability developed by the TFA to address a user need without spending time and money on a development effort. As such, it is employing a suite of highly mature technologies, and assuring that the systems are integrated and tailored for a specific application.

A major concern expressed in the procurement specification was the requirement for 2000 hour MTBF for the electrohydraulic manipulator. The PI reported that the supplier has documentation that their equipment can meet or exceed this requirement, based on over one hundred fielded units. In addition, the PI has developed a spare parts inventory list that will greatly reduce schedule risk due to failure of key components.

3. Cost Effectiveness of the Proposed Solution

Two considerations were addressed in evaluating cost effectiveness. The first is the (expected) economy of the solution in comparison to the baseline approach, and the second is the value of the product in relation to the development-deployment investment.

It is clear that substantial cost benefit will be realized if the system performs as predicted. To that end, it is appropriate that the approach for this first generation system is "bare-bones", in that it is not necessary to have additional functionality to capture most of the benefit. Although specific cost comparisons were not presented by the PI, backup information provided shows significant effort in evaluating alternatives, and establishing the benefit compared to the baseline. In this case, even if the cost benefit were zero, the benefit of dose reduction to workers would justify the work.

Recommendation of the Review Team: Track actual costs following deployment to gain insight to differences between expected and achieved benefits. The differences may provide insight to areas for future improvement or development.

TFA Response: Concur. This will be incorporated in the TFA's plans to assess opportunities for future improvements.

The budget for the project was presented at a high level, and was not rigorously evaluated. However, the cost sharing and role definition of the contributing parties, as redacted in the MOA, indicates a high level of planning and assures a smooth progression through deployment. While the budget was not evaluated *per se*, it is apparent that this project is appropriately funded, and appears to be on track to deliver high value for the investment.

There are risks and limitations that were acknowledged by the PI. These include the vulnerability of the arm to collisions, and the fact that it will not be allowed into pits that have a flammable gas concern.

Recommendation of the Review Team: Revisit the project in a year following deployment to assess how reliant the user has become on the new capability. If consequences to a loss of this new capability become significant, the provisions to quickly replace the Cybernetix arm should be reevaluated.

TFA Response: Concur. This will be incorporated in the TFA's plans to assess operations for needs not met by the original system.

4. ES&H Risk Evaluation and Mitigation

The value of this project will rest largely on how effectively it reduces risk to workers. The PI has established several measures that are needed and appropriate to assure that the objectives are met. These include an early hazards analysis, failure modes analysis, and cold testing of procedures with actual operators.

The cold testing will be important to establish the completeness and appropriateness of the hazards and related procedures. The handoff from the technical team to the operations organization has been well planned, and is clearly a key element to a smooth transition.

Recommendation of the Review Team: The PI acknowledged the schedule squeeze that has resulted from a delayed delivery of the manipulator. There is a danger in abbreviating the cold testing to recover some of this schedule. There is no indication that the cold tests would be shortened, and we urge that they be continued until the technical and operating teams have full confidence that all systems and procedures work well. During this phase, particular attention should be given to the cameras and their placement relative to the work.

TFA Response: Concur. Cold testing will be done to the satisfaction of the CH2Mhill Hanford Group (CHG) operations staff. They have been intimately involved with all phases of the development so far. The testing is being done at a realistic valve pit mockup located at the Hammer facility. All operations that are planned for the field with their procedures will be tested there, including the use of remote vision. In addition, TFA has identified this project as a candidate for pilot implementation of the Office of Science and Technology (OST) Technology Safety Data Sheet (TSDS) evaluation that will be conducted in conjunction with the International Union of Operating Engineers (IUOE). Results of the TSDS assessment will be made available to the project team and site user.

5. Solution Viability and Delivery

The Pit Viper is a solid commercial foundation that can be used to provide a long-term remote capability for pit refurbishment. The user and developer teams are highly integrated, and the user has expressed strong commitment to deploying the equipment. A key element of this project has been the success in securing the endorsement of the user at all levels – from operators though senior management.

Recommendation of the Review Team: The Pit Viper in its present form is a teleoperated, manual system typical of current systems in use. The TFA should consider additional investments in conjunction with the decontamination and decommissioning (D&D) automation activities in the Deactivation and Decommissioning Focus Area (DDFA) that would extend the productivity and operational safety (to the system hardware). A majority of the tools and ingredients for computer-programmed control, and computer assist functions for teleoperation are through Gate 3 and ready for integration into the Pit Viper. Given the large number of pits and similarity of many tools/operations, very significant improvements in productivity can be expected. (POC: D&D Robotics Crosscutting Program [Robotics] Manager, Dennis Haley)

TFA Response: Concur. This will be incorporated in the TFA's plans to assess opportunities for future improvements.

User Review Comments/Recommendations and TFA Responses

Including the use of photography in the control software would be a very valuable enhancement. How has the system been designed for ease of decontamination? What about maintenance provision? Has a critical space/long-lead equipment list been developed - Good job as answered during presentation. Force feedback would be a desirable enhancement. Very good!

TFA Response: Regarding decontamination, minimization of catch points is in the arm specification. The arm will be sleeved in service. The arm is designed for maintenance. There are 100 similar arms in the field, so the maintenance history is known. A critical spares list is in place. Force feedback was held out for simplicity and initial cost. Following success in the field this would follow in the next arm, if deemed a necessary and desirable upgrade by CHG operations/engineering

(A9508) Decontamination Process Waste Volume Reduction

TAG Review Comments/Recommendations and TFA Response

The review team was George Vandegrift (lead), Larry Tavlarides, Major Thompson, Wally Schulz, and Bruce Kowalski. The primary source materials used to evaluate this project were a draft report and three interoffice memos supplied to the review team by the TFA prior to review. The view graphs presented at the review itself were at a high, programmatic level, which were not helpful in a technical review. However, during the review, the technical content of the interoffice memos were discussed in detail.

According to the TFA FY 2000 Multiyear Technical response, two tasks were funded beginning in FY 2000:

- Task 1. Decontamination Methods Development: To investigate commercially available industrial technologies that fulfill decontamination requirements but generate significantly less waste.

- Task 2. Develop Filter Leach Process: To develop a process to replace the current HEPA filter leach process.

According to the Project Fact Sheet,

- The status at time of writing was that industrial vendors were being interviewed.

- For FY 2001, task 1 activities were to include (a) completing identification and evaluation of industrial equipment and technologies, (b) conducting radioactive demonstration of the HP/CORD decontamination process on Idaho Nuclear Technology Engineering Center (INTEC) equipment components, and (c) completing evaluation of Russian decontamination methods.

- For FY 2001, task 2 activities included (a) developing a test plan for two technologies being tested to minimize waste from treating high-efficiency particulate air (HEPA) filters, (b) investigate alternative methods for HEPA-filter stabilization including direct vitrification and other chemical stabilization methods, and (c) provide information to support alternative processes for spent HEPA filter processing.

None of the information supplied by the TFA addressed task 1, parts a and c and task 2, parts b and c. They were mentioned during the presentation but not at the level they could be reviewed.

As far as the TAG reviewers could see, task 1, part a is not in the current task plan. It is also our understanding that no actual, radioactive, contaminated samples were or will be tested in the HP/CORD process during FY 2001; only tests using simulated Cs/Zr coupon tests have been run.

The TAG reviewers did not read or hear of the task plan being developed for two technologies in task 2, part a.

Included in the TFA information was a memo entitled "EVALUATION OF DECON VENT CONDENSER." The TAG reviewers were not clear if this was part of this project or not; this activity did not seem to fit into the funded tasks.

The TAG's questions to the presenter were based primarily on their prior reading of (1) the draft report entitled Scoping Tests Using a Siemen's HP/CORD Type Decontamination Process at INEEL[(a)], (2) a September 27, 2000 memo from M. J. Ancho to R. L. Demmer, "SIEMEN'S DECONTAMINATION DEMONSTRATION,"[(b)] and (3) a September 21, 2000 memo from J S Hu to R. L. Demmer, "LABORATORY EXPERIMENT OF A PROCESS THAT LEACHES CONTAMINATED HEPA FILTERS AS A PULP."[(c)]

The TAG reviewers were given no information on the experimental activities or results gathered during the first half of FY 2001.

The review group was supplied with five review criteria and questions to help guide our thinking. Those five criteria are:

1. Relevancy to user needs and requirements
2. Technical merit and maturity progression
3. Cost effectiveness of the proposed solution
4. ES&H risk evaluation and mitigation
5. Solution viability and delivery

The finding sections will be divided into six sections based on these five criteria and other findings that don't easily fit into the first five.

Findings of the Review Team

1. Relevancy to User Needs and Requirements

   Rick Demmer's presentation addressed this issue well. This project addresses a well-defined, important need at INEEL and the entire DOE complex. The high importance to INEEL is evidenced by the site co-funding the project in FY 2001 at $1085K. The strong ties between the researchers and plant operations were also a topic of Demmer's presentation. It is clear that Rick Demmer, the PI for this effort, understands the need to reduce waste generated during decontamination operations at INEEL and to find means to economically dispose of HEPA-filter waste. He presented specific information on the liquid waste generated during current decontamination operations and tied it the INEEL 2012 milestone to cease use of the liquid waste storage tanks.

(a) Hereafter, Reference 1
(b) Hereafter, Reference 2
(c) Hereafter, Reference 3

2. Technical Merit and Maturity Progression

It was clear from the topics presented in the PI's 20-slide presentation that he did not understand the function of the TAG or the purpose of the 90-minute project review. The slides were all at a high level and presented no actual data or results. For this reason, the TAG cannot assess the technical merit and maturity of the following aspects of this project:

- Evaluation of Russian technologies
- Evaluation of commercial methods
- Alternative treatments of HEPA filters (ANL-W contract and direct disposal options)

However, we did learn from the presentation that:

- The Russian contract is behind schedule
- Eight vendors responded to the call and the funds available for commercial contracts have cut individual contracts to $7K each
- The treatment studies for HEPA-filter disposal are not showing great success thus far.

Because of (1) the reading we did before the review and (2) the relatively short time the review team had for the review, the major questions to the PI were primarily related to the Siemen's decontamination unit and the HEPA-filter leach testing. Based on reading the reports and clarification by the PI, the TAG reviewers believe the activities for both projects (1) show a lack of technical knowledge, (2) were poorly planned, and (3) were poorly executed. Specific concerns are list below for each task.

Siemen's HP/CORD Decon System

The system itself seems like an excellent technical choice, and the chemistry and engineering of the original Siemen's system appear sound. Our concerns are (1) on how the testing was planned and performed and (2) with plans for "deployment" without demonstration. Specific examples of our overall concern are listed below.

- The system that was delivered was not as complete or operational as expected. According to the PI, extensive work at INEEL was required to get the unit operational. Why were they not more aware of what they had purchased? It was not clear if functional requirements were developed nor how the system performed during acceptance testing.

- The HP/CORD system did not come with a UV source for destroying oxalic acid by peroxide. The 20-W source that was added to the system was not properly sized and did not meet destruction needs. It was not clear that the PI performed any bounding studies to attempt to size the UV source. Reference 2 states: *"The first set of tests determined whether the UV/H_2O_2 oxidation system would function as expected."* Reference 2 also states: *"The conclusion was that the oxalic acid in the test system was not adequately treated/destroyed by the INEEL system. However, some earlier*

studies (ref 5,6) showed that by selecting an appropriate UV source with enough intensity (perhaps 100 x more powerful), oxalic acid could be oxidized (either by ozone or H_2O_2) within reasonable time duration. In addition, we believe the system was probably not operated under the most efficient conditions." The TAG does not understand how the project staff could have moved forward on designing, building, and installing the *UV/H_2O_2 oxidation system* without a technical understanding of its operation or consulting the literature or experts (commercial and/or scientific). After it failed, the project staff did find at least two 10-year-old references that told them why it failed.

- The TAG reviewers have deep concerns about deploying this unit at the end of this year without testing it with samples of actual contaminated materials. There was considerable doubt regarding the representativeness of the SIMCON II coupons, which was expressed by the PI, to demonstrate the effectiveness of the system. It was not apparent what information the PI had that gave him such confidence in the SIMCON II coupons?

- The decontamination unit the site needs for plant operations must have a much larger ultrasonic bath than the 5-gal unit the project staff are testing. The current test unit is scheduled to be deployed at the end of FY 2001. According to the PI, this smaller unit can be used to decontaminate tools, perhaps a small pump. Tools are generally made from hardened steel; many are chromed. The kind of contamination and origin of contamination should be significantly different for tools than for plant equipment (e.g., piping, valves, etc.), which are made of stainless steel and represent the actual decontamination need for this task. The TAG reviewers are concerned that the demonstration of the technology on tools will not show its effectiveness where decontamination is required to significantly reduce larger scale liquid-waste generation.

- Reference 1 states: *"The ion exchange resin is used to regenerate the oxalic acid and provides an almost infinite capacity for metal removal."* This statement appeared exaggerated and meaningless. Under questioning, the PI stated that he had no information on how often the cation- and anion-exchange resins need to be regenerated and/or replaced. Further, he did not know if the resins will be regenerated or replaced or if the resins or the regeneration solutions will be classified as mixed waste. He also had not looked at means of disposal. This is one more indication of how the PI is not planning and/or looking at the entire picture.

- Other potential secondary wastes were not addressed either.

Alternative Leaching of HEPA Filter

According to Reference 3: *"To prove the advantages of the Pulp Process, a series of laboratory tests have been performed to 1) Determine which chemical reagent performs the best in calcine dissolution. 2) Determine the effect of sequential addition of reagent. 3) Determine the* optimum *reaction temperature. 4) Demonstrate the advantages of the*

Pulp Process over the current FLS at optimum operating conditions." The TAG's concerns have similar bases to those for the HP/CORD work. The work presented in Reference 3 appears to have been executed without (1) an understanding of these stated objectives, (2) a review of previous work (the literature and the wealth of INEEL work on dissolving calcine), (3) proper planning, and (4) an understanding of basic chemical principles. Specific examples are listed below.

- Previous studies surveyed six different dissolution reagents. The reagent choices were clearly not made on the bases of calcine chemistry; rather, common decontamination solutions were chosen (nitric acid, oxalic acid, sodium formate, Corpex 921, Turco 4502, and Turco ARR). No mention was made as to the choices based on INEEL's experience dissolving calcine. The range of nitric-acid concentrations tested is not given, but 2N is stated to be the most effective. This concentration sounds low based on other INEEL calcine-dissolution work.

- No mention was made (or concern shown) that calcine itself and dissolution of calcine are not homogeneous. Results by others at INEEL have shown that some radionuclides concentrate in the undissolved fraction. These concerns should have been addressed in a properly planned research program.

- It is the TAG reviewers' opinion that the apparatus and method for the sandwich test is not appropriate for simulation of the current process. Neither does mixing calcine particles with filter fluff simulate the proposed process. Using 250 mL of solution to dissolve 3 g of calcine seems like a lot of solution per mass of calcine. (Calcine dissolution testing by others at INEEL is done with 10 g calcine per 100 mL of nitric-acid solution.) What are the bases for choosing these conditions? How do they relate to the current and proposed processes?

- The calcine in both sets of experiments were separated from the filter media and weighed. How much was retained in the filter media and not really dissolved? This should have been addressed. Was it? What were the results?

- The portion of this report that caused the most concern and seemed totally inaccurate was the section on Nitric Acid Addition Order. In this section, the PI felt he was looking at the effect of incremental addition. According to Reference 3, *"In both sets of tests, the total nitric acid additions are 2N (1N + 0.75N + 0.25N)."* Although the report does not clearly define how the experiment was actually performed, this statement is never true. One interpretation just makes this statement more outrageous. When these types of statements of technical ineptitude are observed, all the data and results become suspect.

- In studying the effects of temperature, the PI reached the conclusion that dissolution rate increased with temperature. (The TAG reviewers hope the PI knew that before testing!) Reference 3 states, *"If conditions permit, therefore, it is suggested that the calcine dissolution process be carried out in a temperature as high as possible, with boiling solution being the best choice."* Again, this is proof that the program appears

to be working in a technical vacuum. During the presentation, the PI made a point of saying how close the project staff work with the operations people. If this is correct, why does he not know the answer to '*if conditions permit*' or how high is possible? These appear to be data that the operations organization could provide.

- Reference 3 states: *"Those results are very encouraging and promising in demonstrating the advantages of the pulp process over the current process."* There are relatively small differences in results between the two types of experiments (PP and Sandwich). The TAG does not believe the plant staff would agree to make a technology change based on these results.

3. Cost Effectiveness of the Proposed Solution

   Because of ineffective planning, development and demonstration, the TAG cannot make a judgment on this criterion.

4. ES&H Risk Evaluation and Mitigation

   According to the PI, the project staff are working very closely with plant operations to assure ES&H compliance. Two potential ES&H concerns were voiced by the TAG during the review for deployment of the Siemen's HP/CORD system:

   - Acidic permanganate is a dangerous chemical, and foolproof strategies must be in place to assure concentrations do not reach unstable levels.

   - High-frequency sound from the ultrasonic bath may cause discomfort to some workers. The unit may need to be soundproofed.

5. Solution Viability and Delivery

   Because of the inadequate demonstration in the case of the Siemen's system and inadequate development in the case of alternate HEPA-filter leaching, the TAG reviewers could not make this determination. However, we do offer the view that the "deployment" of the test Siemen's system scheduled for FY-02 is more correctly characterized as a hot demonstration.[(a)]

6. Other

   The TAG review team encourages INEEL to continue attempts to find means for direct disposal of HEPA filters. We understand the difficulty caused by their high radiation field due to the high activity of the calcine trapped inside the HEPA filters. However, this could be the surest means to eliminate large volumes of leaching solutions.

(a) Concerns about the hot demonstration are found under the Technical Merit and Maturity Progression section of this review.

Recommendations of the Review Team

The TAG has serious concerns about the technical direction of this project and recommends a thorough review. This review should evaluate:

- Experimental planning documents
- Past experimental methods, data, results, and conclusions
- Technical experience and expertise of experimenters
- Future direction

Additional Comments of the Review Team

Even with these harsh comments related to the technical aspects of this project, the TAG would like to compliment the PI, Rick Demmer, for his professionalism. He appeared to take our comments, questions, and criticism as constructive. He knew they were not personal but only to make this program as productive as possible. We also appreciate the concern and support shown by INEEL, DOE, and TFA management.

TFA Response: The TFA concurs with the TAG's recommendations and is working with the site user to plan and schedule this follow-up review. INEEL has conducted an internal review of this work based on the TFA TAG concerns and technical issues. Results of this review and a specific response will be prepared and provided to the TFA for evaluation and planning for further actions as needed. As the site funds the majority of this work through its own budget, TFA expects the site to provide primary direction in responding to the concerns raised during the reviews.

User Review Comments/Recommendations and TFA Responses

Waste minimization is one of Idaho's highest priorities. There have been waste reductions averaging 60 to 70% each year. TFA has helped fund this work. The work is broad based all the way from operations personal being cautious as to the amount of solutions they use to testing new technologies (TFA funded). I don't appreciate comments like "you do not know what you are doing in Idaho"! One of the big problems was a miscommunication. Rick Demmer gave more of a status than a review. He should have been better prepared to do a "technical review". Our fault.

TFA Response: The TFA recognizes the issue and will work to ensure in the future that all parties (TFA, sites, PIs) have a clear understanding of the objectives and content of the review, so that they can prepare accordingly. As the site funds the majority of this work through its budget, TFA expects the site to provide primary direction in responding to the concerns raised during this review.

(A9768a) Specify and Enhance Design of HLW Glass Melters - INEEL Melter Development

TAG Review Comments/Recommendations and TFA Response

This project appears to be well connected with INEEL needs, is solid technically, and is making good use of existing DOE facilities and capabilities. The present status of the program appears to be Stage 4 - Advanced Development. Additional work at this level with alternative melter technologies is anticipated. Primary melter options should be considered at the Gate review to proceed into Stage 5. Main concerns are:

- Future adaptability of the sodium bearing waste (SBW) vitrification facility to calcine waste
- Adequacy of resources for the present SBW vitrification program, in light of the 2012 deadline.

INEEL is in the early stages of identifying glass compositions and melter technology for immobilization of both liquid SBW and dry calcine waste. Current agreements between DOE Idaho Operations Office (DOE-ID) and the State of Idaho require that SBW be immobilized well before calcine, so sequential operation of a vitrification facility for the two types of waste is envisioned.

There are significant uncertainties in the nature of the waste. In addition, a critical decision has not yet been made on whether to vitrify the existing calcine, or to redissolve and pretreat it before vitrification of a high-level waste (HLW) fraction.

This review addresses the development of melter technology. In addition, comments are included on the INEEL Glass Formulation Activities presented by David Peeler, since the future course of this development depends heavily on the rate of progress and results of the composition work.

Findings of the Review Team

This project was reviewed March 13, 2001, at Salt Lake City by TFA-TAG members Woolley (lead), Gentilucci, Weber, Bell, Erdmann, and Roecker. This review is based on a presentation by Chris Musick plus supporting documents, with Review Criteria provided by TFA. Six TAG members provided written comments on the program. The following summary represents their consensus views, organized by the review criteria.

1. User Need/ Involvement/ Requirements

   INEEL's need for vitrification technology is evolving, since it depends on results of ongoing waste characterization and pretreatment development programs. In spite of the uncertainties it is appropriate that work is underway to identify melter options. Three other activities are underway that should provide significant new inputs during FY 2001 for decisions on melting technologies for INEEL:

- Glass formulation activities at PNNL and Savannah River Technology Center (SRTC)
- Trials in Russia and France of cold crucible induction melting processes
- A review of HLW melter and waste products, which will recommend next-generation technologies for further development by DOE

Downselection of melter technologies should be delayed until inputs from these activities are available.

Based on information available for this review, planned INEEL activities and funding do not appear adequate to both develop a process for SBW and identify interfaces and facilities which will be needed to adapt the process for melting calcine. Scheduled activities are necessary but inadequate to identify melting processes for both SBW and calcine in time to be incorporated in plant design.

2. Technical Merit

Overall, the program looks solid technically for addressing the initial processing requirements and melter capabilities for SBW. The program appears to cover technical uncertainties. Good use is being made of expertise at PNNL and SRTC. A logical program of testing is planned for SBW vitrification. However, if melter technologies other than the conventional HLW joule heated systems are to be considered, a substantial expansion of the proposed testing program will be required.

There is some concern that glass property requirements (e.g., viscosity, liquidus, resistivity) are being carried over from joule-heated Inconel melters to cold crucible induction melters, with consequent loss of opportunity for maximum waste loadings.

Near term melter development should focus on matching melting technologies to the potential range of waste compositions, and identifying show stoppers or high risks. This should influence the directions taken by separations and glass formulation studies. It is too early to select specific technologies and make decisions about sizes and throughputs of individual production units. Engineering and conceptual design studies will be needed to define the throughput requirements as a basis for sizing the production units.

There is a danger of drawing too many conclusions from small scale melting tests. Volatilization in particular is very difficult to predict reliably from small scale tests. Such tests are most useful for identifying the potential for undesirable phase formation or other difficulties that could limit waste loading or production rate. Quantification of the limitations imposed by these difficulties must await large scale testing.

Coordination between the glass composition work and melter studies appears to be very good. The plan to validate the choice of simulants with radioactive lab tests is excellent. This work should be planned after evaluating details of work on radioactive sample vitrification and simulant comparisons performed at PNNL and SRS.

There may be some incentive for TFA to assist INEEL in evaluating whether any features of melter feed preparation or melting chemistry (additives, etc.) might provide a means of manipulating the nitrogen oxides chemistry in the offgas. Some amount of reduction to nitrogen and oxygen might reduce the burden on NOx abatement systems and reduce the size requirements for those plant units. The present plan seems to be based on the assumption that nitrate reduction will occur in the melter. Denitration in pretreatment is another possibility that would reduce requirements on the melter.

In the secondary waste treatment for SBW, the conflict between NOx destruction and retention of elemental Hg is not resolved.

3. Cost

The development project appears to be managed effectively. Good use is being made of existing DOE facilities, such as the PNNL composition and lab melting facilities and the Clemson University pilot melters, rather than duplicating these facilities onsite.

It is likely that onsite pilot melting facilities will be needed for final development and during production at INEEL.

4. Environmental, Safety and Health

No major risks were identified at this early stage.

5. Solution Viability

The current INEEL program for calcine waste assumes that the SBW vitrification facility will be designed to accomplish the calcine waste disposal mission without significant modifications or upgrades. The work currently funded and being performed on this project includes essentially no (near term) effort on calcine waste vitrification, either with or without separations. This is caused by funding limitations and the near term Consent Order Agreement date of 2012 for SBW. This focus on SBW is reasonable within the funding available, but creates a high risk for INEEL.

About 80% of the calcine waste is high in zirconium and fluorine, and the development work (both composition and melter) has focused on this waste. The remaining 20% of the waste is high in aluminum, but neither a blending or separate treatment strategy for dealing with it is evident. There is also uncertainty on the manner in which the residual heels in the SBW tanks after the initial retrieval will be introduced into the processing streams. It may be necessary to test alternative combinations of the different calcine composition types and tank heels to have an adequate basis to select melter systems for calcine.

A key consideration that was not well covered is the issue of choices for feed preparation options and glass former introduction. Options for adapting a feed process for SBW liquid feed to calcine feed should be incorporated into the program. The various feed

methods utilized in European (French and German) and Japanese processes should be considered as alternatives. Obviously, consideration of different feed preparations and introduction options should influence the melter testing.

Recommendations of the Review Team

1. Develop a strategy, using both INEEL and TFA technical resources, for evaluation of INEEL melter technology options. The strategy should address:

   - Projection of performance between SBW requirements with alternative calcine feeds and tank heel requirements
   - Testing needed to resolve compatibility issues for transition between SBW and calcine feeds
   - Separate evaluation of systems which would be optimum for calcine only
   - Plant configuration and systems features which would be needed to adapt or retrofit a different melter optimized for calcine feeds.

   TFA Response: Agree. The Idaho SBW and Calcine Vitrification roadmaps are intended to include all key technology development requirements both TFA and EM-40. However, since the roadmaps were only recently completed, there is additional detailed planning required and updates resulting from glass formulation and melter technology development in progress will have to be made. We believe that with delay of ~1 year from the original SBW project plans, that there will be time to give more consideration to the calcine options-I know that DOE-ID in the roadmap meetings wanted this to occur. The current budget limitations are resulting in a very focused effort on SBW with little left in either the site budgets or TFA to get into calcine separations alternatives. Calcine work has been delayed until FY 2003 due to funding restrictions. However, work is continuing on direct vitrification formulation work to allow assessing if with higher crystalline content the waste loading could be increased sufficiently to reduce the incentive to pursue separations options. The site and the TFA would like to see the program more integrated with calcine. We will continue to keep the importance (particularly from an overall cost perspective) on the screen.

2. Define a set of preliminary melting process requirements and melter capabilities for each potential INEEL waste feed option. This definition should be based on best estimate feed compositions from flowsheets and available characterization data.

   TFA Response: Agree. This is in progress particularly for SBW. Waste from tank WM-180 has been analyzed and WM-89 is in progress. There is radioactive calcine in the Idaho cells for dissolution that will provide additional information on both flowsheets and compositions.

3. Define glass property characteristics/ requirements that would match up with various candidate melter technologies under evaluation and determine compatibility with viable formulations and optimized waste loadings. (Note: this will probably lead to a need for additional compositional variability study (CVS) work focused on specific options.)

   TFA Response: Agree. This is in progress and the CVS work is continuing; however, there has been a near term focus on adding to the SBW early CVS work to address the sulfate issue. We plan to do some additional work this year with both the Russians and the French in evaluating U.S. glass data and its applicability to induction cold crucible melter (ICCM) technology. Based on discussions in France with the CEA scientists, our glass work is very compatible with what is required to formulate for high temperature melters. Based on that work we may have the opportunity to evaluate other glass systems such as the aluminophosphate system for sulfate and chromium.

4. Engage both PNNL and SRTC staff who have performed radioactive waste vitrification studies in hot cells to assist planning scheduled work with actual SBW samples. A workshop format could be used to assure that planning details for performing melting behavior and glass properties tests is appropriately structured to obtain direct comparisons of glass melting and properties between actual waste and best available surrogates.

   TFA Response: Agree. The teams are working so closely together through both the TFA tasks and the development of the roadmaps, that when discussed with the Idaho researchers, they expected this interaction.

User Review Comments/Recommendations and TFA Response

None provided.

(A9768b) Specify and Enhance Design of HLW Glass Melters - SRS Melter Improvements

The Defense Waste Processing Facility (DWPF) at SRS produces a vitrified HLW product for final disposal in a federal repository. Early in the cold testing and during initial radioactive operations a phenomenon known as "wicking" occurred in which the pour stream between the melter and the canister became unstable. This resulted in glass build up in the bellows area between the melter and canister, which required mechanical clean out and major interruptions to plant operations.

Under the TFA task to investigate melter pour spout improvements at SRS, emphasis was placed on not only the immediate need to improve the performance of the operating melter (Melter No.1) but also to evaluate modifications to the spare melters (Melters No 2 & 3) and to determine the underlying fundamental technology behind the "wicking" phenomenon.

This Stage 5 Gate Review was conducted in conjunction with the 2001 TFA Midyear Review. The review consisted of a presentation of the project status and plans by the PI followed by a question and answer period. The PI presented information on the work, which has been performed, both from an experimental and theoretical basis.

A technical review of the DWPF Melter Pour Spout Improvement program was conducted on Tuesday March 13, 2001 in conjunction with the TFA 2001 Midyear Review. The TAG reviewers of this Gate 5 review were:

J. A. Gentilucci (Lead)	Consultant
E. T. Weber	Consultant
F. E. Woolley	Consultant
J. Bell	Consultant

The program was designed to address the real time problem with the currently operating DWPF Melter and to develop improved performance characteristic for the spare melters at DWPF.

The program functioned as a cooperative effort between the TFA PI, the User Cognizant Engineer and the University Representatives. This close knit approach proved very successful in effectively establishing expectations and translating requirements between the organizations.

Findings of the Review Team

- The program provided quick responses that permitted insert developments that improved the function ability of the No 1 DWPF Melter

- The theoretical technical work provided insight into the basic causes of the "wicking" problem.

- Development and testing of insert designs for the spare melters will provide an improved operations efficiency when those melters are deployed.

- The availability of an operating experimental melter at Clemson was instrumental in being able to perform this testing in a short time span and emphasizes the need for TFA commitment to melter technology.

- The design of DWPF No. 3 Melter modification or future melters can be enhanced by this newly confirmed technical knowledge.

- This was not a typical EM-50 development program due to the rapid evolution and demonstration of alternate insert designs for the No. 1 DWPF Melter.

Recommendations of the Review Team

- The testing of the pour spout configuration for No. 2 Melter be completed at the Clemson test site, documented and then the program terminated.

  TFA Response: Agree. This will be clarified for Melter No. 2 testing in the Multiyear Technical Response (MYTR) and FY 2002 Development Plan. The TFA will work with SRS and Clemson staff to provide guidance to complete and document the work in a timely manner.

- Advanced imaging systems should be used for future melter pour spout tests and evaluations prior to incorporating them into the DWPF Melter design.

  TFA Response: Agree. This will be clarified and incorporated into the MYTR and other appropriate program planning documents. A system will be recommended to DWPF.

- The University work performed in conjunction with the program be documented and the program closed.

  TFA Response: Agree. The TFA will work with FIU to close out this work and develop a recommendation to redirect funding to other tasks.

- DWPF consider modifying the No. 2 and No.3 Melters or future melter riser, pour spout and heaters to provide either;
  - a flooded pour spout configuration by relocating the pressure differential control point to the end of the riser and reducing the pour spout diameter (this would act as a siphon break).
  - a horizontal extension of the riser, to allow the canister and pour turntable to be raised, thereby shortening the pour spout and reducing the free fall distance.

These configurations could be tested on the Clemson melter. (The replacement riser assembly for No. 2 Melter could be fabricated and swapped after it is constructed so that a spare melter would be available except for the short period during the modification.)

TFA Response: These options will be reviewed with the Task Technical Team and the DWPF customer in a meeting that includes the Immobilization TAG. A consensus path forward will be developed with appropriate modifications to the task.

1. User Need/Involvement/Requirements

The "wicking" problem was an immediate need of the user both as a short-range objective for the operating unit and modification to the spare units. The user, therefore, had a very keen interest in supporting the development of solutions to the problem. This was evident by the close relationship that developed between the User Cognizant Engineer and TFA PI on exchanging need requirements and production testing of insert concepts. The User was also involved with all aspects of the basic studies performed by the various Universities. This was a very successful arrangement.

2. Technical Merit

The program had two basic objectives that it needed to relate to:

- How to improve the installed melter pouring capability in order to maintain reasonable operations
- What modifications should be made to the next Melters to essentially eliminate the problems;
  - Short term for existing spare melters
  - Long term to define technical principles applicable to redesign.

Improvements to permit DWPF to accomplish a reasonable operating basis have been demonstrated as a result of TFA and User cooperation. A number of reiterations on inserts have been made and actually tested by the User in the production facility. This has been based on both empirical data gained from the site and theory related to fluid flow. Some of these concepts were also tested at the universities to confirm the results and add to the database.

The longer-range programs have been a collaborative effort between the PI, Cognizant Engineer and the Universities. Experimental and theoretical calculations have been extensively used to determine the underlying technology associated with the problem. A better understanding of the interrelationships of physical characteristics such as wetability and surface tension interactions with flow rates, temperature gradients and viscosity have been developed.

This knowledge has resulted in a proposed improved design for modifying the pour spout of the spare melters. This modification has been approved by the User for testing, on the Clemson melter (that has been used for pour spout testing) as a means of providing a demonstration.

All the proposals that have been developed in this program were based on strong technical merit.

3. Cost

The Pour Spout Improvement program was supported by a combination of TFA and User funding. This funding level is adequate to support the remaining demonstration program and documentation of the university studies. An estimate of cost savings presented by the PI indicates that this technical program has a high pay back ratio on both capital and life cycle costs.

4. Safety, Health, Environmental Protection, and Risk

The user is not impacted in an ES&H perspective by this program since the changes are all associated with remotely located equipment and is inconsequential compared to the overall facility risks.

The ES&H aspects associated with the University work was subjected to hazard reviews and engineering inspections as well as procedural controls. The interfaces provided by the PI and Cognizant Engineers relative to the SRS requirements for experimental testing were translated to the program at the test locations. This work appears to have been carried out in a manner that would meet the latest ES&H procedural requirements.

5. Solution Viability

The program has developed viable inserts that have contributed to the successful performance of the DWPF Melter No. 1.

The additional knowledge gained by the work performed in conjunction with the universities has provided an improved design concept for inserts that will result in higher melter performance when the spare melters are placed in service. The User is waiting the final testing of this design at Clemson so the design changes can be incorporated in the DWPF Melter No. 2.

User Comments/Recommendations and TFA Response

The project has advanced the understanding of pour spout hydraulics that will lead to better design of pour spout/pour spout inserts. We are confident that the project will provide the user with technology to systemize pour spout geometry.

TFA Response: The TFA concurs and appreciates the feedback.

(A9777) Remote Disassembly of HLW Melters and Other Process Equipment

The primary technology in this project (glass removal) is currently in Stage 3-Exploratory Development. Remote handling equipment, directed at initial deployment, is in Stage 4-Advanced Development. These two project elements will need to reach similar levels of development for transition into Stage 5-Engineering Development and Stage 6-Demonstration. A thorough independent review should be performed as a basis for proceeding into Stage 6, and should probably be performed before completion of Stage 5.

TFA Response: Agree. Note that the primary technology is melter/equipment dismantlement, and glass removal is the initial step and a part of the task. The TFA will schedule a technical progress and/or gate review to monitor the progress of this work as is continues in FY 2002.

This project is intended to provide the technologies that will be needed to dismantle and dispose of melters and other related HLW processing equipment used with radioactive wastes. The primary focus is on the joule heated ceramic melters currently being used at the WVDP and the DWPF. Objectives of the work on melters includes defining methods for removal of glass from end-of-life melters, removal of contaminated refractories, sorting and classifying these materials for disposal, size reduction and decontamination of melter structurals. Scope of work includes development of methods and remote equipment followed by demonstration of these systems on melter mockups or an expended pilot melter. Another need is to deal with disposal of replaceable melter components and any glass debris resulting from failures during service. In addition to melters, there is a need to resolve the regulatory requirements and to develop the means for disposal of related process equipment and vessels. This includes methods for size reduction, decontamination and packaging. A major result of these development and demonstration activities will be the preparation of recommended specifications on equipment for use in HLW processing facilities.

This review was based on a presentation by the PI covering the status of planning, background and potential technical features of this work. Useful questions, answers and discussion followed the presentation. Related documents covering experience in dismantling a non-radioactive pilot test melter and potentially applicable remote technology reviews were provided to the Reviewers in advance of the meeting. The Midyear Review program also included presentations on related vitrification facility equipment break-down and disposal technologies being developed and deployed at the WVDP.

The technical review of the Melter Disassembly and Glass Removal task was performed in conjunction with the TFA 2001 Midyear Review held March 12-16 at Salt Lake City, UT. The designated Reviewers for this activity were:

Tom Weber (Lead)	Consultant
Jimmy Bell	Consultant
Joe Gentilucci	Consultant
Bill Hamel	U of Tennessee
Frank Woolley	Consultant

WVDP clearly has the greatest need for technical solutions to glass removal and melter disassembly, since that program is nearly finished with HLW waste processing. The existing melter is expected to be ready for disassembly within the next several years. A project for design, fabrication and installation of remote disassembly and packaging equipment, known as Vitrification Expended Material Processing System (VEMP), is in progress at WVDP, supported by Accelerated Site Technology Deployment (ASTD) funding. An interface between that project and the melter disassembly technology demonstration is intended. DWPF has identified a need for melter disassembly technologies, but there is no active project planned which would deploy the capability.

Findings of the Review Team

- The basis for planning the development activities in this project needs to be further developed. Except for WVDP, the needs for glass removal and melter disassembly capability from the vitrification sites are not well defined. The change in program status at Hanford from privitization to a DOE-directed prime contract should bring Hanford needs back into the picture. The overall regulatory and waste acceptance requirements that will affect disposal for all sites have not yet been defined.

- The project has done a good job of involving staff that have recent and applicable remote disassembly/dismantling experience (e.g. the remote CP-5 dismantlement project).

- The program planning does not clearly distinguish between technical solutions for glass removal in two different cases:

    1. the melter fails and cools with glass in place (or may have partial draining), requiring methods to mine out solid glass;
    2. the melter is hot and operable but is ready to be taken out of service, requiring methods to remove as much molten glass as possible.

  TFA Response: The project focus is on melter dismantlement and disposal with removal of residual glass as part of the task. The removal of molten glass is not a part of this task, but since WVDP had done fairly extensive planning in this area, we included it in one of the reports as means of sharing technology. The TFA will continue to work with end users at SRS and WVDP to evaluate and further clarify needs as part of the TFA needs/response process. Specific guidance for the FY 2002 program will be defined in a development plan that will be reviewed by the end users to ensure consistency with the latest needs and requirements. Although specific needs for Hanford have not been defined, information on the planning and results of this work will be communicated to ORP/RPP personnel for consideration and evaluation with respect to future work.

- The technical strategy for glass removal, as presented, is limited to a tooling selection. It is critically important that the kinds of remote manipulation systems, and the requirements and constraints that tools will impose on manipulation equipment performance (e.g. reaction forces) be established for this phase.

- The approach to cold glass removal development and demonstration appropriately emphasizes technical and cost effectiveness. It emphasizes evaluation of the more obvious mechanical methods (e.g. chipping, abrasion etc.). However, the approach appears to lack any exploration and potential evaluation of innovative techniques, which might be more amenable to remote manipulation.

- Melter refractory removal/break-up/sorting/classification may present challenges equivalent to glass removal, but does not appear to be so recognized in development planning.

  TFA Response: Refractory removal/breakup was covered by previous ORR and WVDP reports. Refractory removal/breakup is being covered in the DWPF Melter dismantlement report as well as the demo test plan that is due 8/30/01.

- An added dimension of the glass removal problem emerged from discussions during this review. There is an important issue on potential remediation of liquid fed ceramic melters (LFCMs) that are failed or compromised during processing of feeds with high noble metals content. Capability to remove glass containing noble metal deposits might allow a melter to be returned to service, rather than scrapped.

  TFA Response: Agree. This dimension is a main driver for glass removal from a melter and will be considered in developing future planning for this work.

Recommendations of the Review Team

- TFA should obtain, as soon as possible, a statement of needs and planning for disassembly and disposal of melters from ORP, in the context of their re-planning of Waste Treatment and Immobilization Plant (WTP) activities under the new contract. This information should be factored in to A9777 (B777) activity planning.

  TFA Response: Agree. TFA will pursue this with Hanford representatives of the TFA Management Team and the User Steering Group (USG) to determine interest in submitting needs in this area. If needs are, TFA will develop plans and responses through the planning process for FY 2003 and, as feasible, incorporate these needs in the planned scope for FY 2002.

- As part of this project, TFA should coordinate an evaluation of regulatory drivers and costs associated with final disposal of HLW melter equipment and scrap glass. This should address whether a Waste Incidental to Reprocessing (WIR) determination, common for all HLW vitrification sites, would have potential to reduce the volume of such waste packaged for costly repository disposal vs. low-level waste disposal. The goal should be to establish the most cost effective disposal requirements, waste classifications and paths applied uniformly by all sites.

  TFA Response: Agree that a WIR determination would be beneficial but it is not funded by the current budget, nor is it within the scope of a technology development investment

that TFA would normally undertake. However, the WIR process being used for the ASTD "size reduction of expended materials" task may be leveraged to this task, particularly as WVDP gains experience with their procedures. This suggestion will be discussed with the end users for their consideration.

- The scope of the development activity, especially for glass removal, should be expanded to include exploration and development of more innovative solutions. Examples of innovative processes might be thermal shock breakup based on cryogenic fluids and/or localized heating or application of ultrasonic or piezoelectric actuators.

  TFA Response: The current plan is to use simple existing technologies and adapt as necessary to accomplish this task. The remote systems work previously done by Robotics will be our first source. If existing technologies will not work, then more innovation will be required. These suggestions will be brought to the attention of the project team for consideration.

- This task should be expanded or a new task initiated to address glass removal as a means of extending melter life when processing high noble metals feeds. Scope should include: cost incentives analysis, feasibility of cold or hot glass recovery actions and options for interdicting a noble metals sludge layer.

  TFA Response: The task currently will try and demonstrate the removal of glass from the bottom of a melter for noble metals recovery. A cost analysis could be done as well. TFA will evaluate this in preparation of the development plan for FY 2002 work for this project.

- This task should promote a reassessment at DWPF of the feasibility of vacuum extraction of molten glass from the melter as a basis for disposal enhancement or noble metals remediation.

  TFA Response: It is our understanding that vacuum evacuation is not very compatible with the DWPF design. In the interactions that the PI has had with the DWPF, they were very unreceptive to vacuum evacuation. However, we will verify the compatibility of the existing design with vacuum evacuation.

1. User Need/Involvement/Requirements

   While some aspects of this project appear to lack a desirable degree of integration, this is understandable in the context of recent changes in the PI assignment. It was necessary to move the lead from WVDP to SRS due to personnel changes associated with the recent Hanford vitrification contractor change. Reviewers expect that improved integration will result from strong attention to upgraded planning by the new PI.

   The user needs driving this project leave something to be desired. There is clearly a high degree of involvement by WVDP, since they have a schedule driver to establish melter

disassembly capability. The SRS situation is diffuse, with a long-range desire for capability, but no specific schedule driver and no melter D&D facility project in planning.

TFA Response: Agree. However, the work being done primarily in support of WVDP will benefit SRS and DWPF in planning for future work in this area. TFA is not in a position to specifically drive the need or planning for an SRS D&D facility, but it will be recommended in the DWPF Melter D&D report.

Requirements for melter D&D capability at INEEL are very tentative, until a specific melter technology is selected for their vitrification project. At Hanford, provisions for spent melter disposal D&D is currently an unresolved issue. This situation has apparently changed relative to the prior privatization contract. It is reasonable to expect that a disposal basis will need to be established in the WTP designs by the new contractor, under direction from DOE. Thus, the drivers for Hanford have the potential to be stronger in the near term than needs currently identified by SRS and INEEL. This project should aggressively pursue an understanding of the current design and planning basis for melter D&D at Hanford, and any related need for technologies and demonstrations.

TFA Response: Agree. Hanford will be contacted; however, near term involvement may be limited by their other priorities. The results of the work in support of WVDP will be available to Hanford for their consideration and will likely provide benefit to their planning and needs evaluation.

One concern of reviewers is the possibility that precedents might be set in the way that WVDP interprets requirements and establishes disposal paths. An example is the plan to package melter instruments contaminated with thin layers of glass into repository canisters, versus packaging for disposal that could meet LLW or Waste Isolation Pilot Project (WIPP) radionuclide regulatory limits. An expedient solution for the relatively small volumes of equipment wastes at WVDP might be quite costly if applied to the larger scale requirements at SRS or Hanford. In a similar vein, there is concern that glass removal solutions adequate for near term use at WVDP might not be optimum for the other sites.

At this time, there does not seem to be a set of specific requirements or guidelines that govern the preparation of miscellaneous HLW glass materials for disposal. The repository Waste Acceptance System Requirements Document (WASRD) does not provide any specifications for waste packages containing such materials; at this time, it would appear that canisters containing miscellaneous glass materials or melter component parts would be classified as non-conforming items. Considerable value to all the vitrification sites should result from determination of what kinds of packaging for these materials would be acceptable for repository disposal. Also, determination of what quantities of HLW glass, as contamination on melter components or refractories, could be acceptable for disposal at one or several DOE low-level waste facilities might provide for more cost effective disposition of some melter components. Definition of spent melter materials packaging options should be brought to an EM-Office of Radioactive Waste Management (RW) interface for evaluation and resolution of specifications for repository

disposal of such materials. This should be coordinated by TFA, possibly as part of this project, to assure that the requirements and needs of all the sites are covered in establishing a general framework for all the DOE HLW vitrification plants.

TFA Response: Agree. However, addressing regulatory issues and implementation requires different skills and should probably be handled jointly between the affected sites. TFA could certainly assist in coordination and exchange of information. TFA will review with the site representatives.

There is a separate sub-task in this project dealing with DWPF melter cell remote cleanup issues. DWPF has submitted needs for remote systems to recover glass and small components from the melter cell. TFA may be in a position to coordinate a technical evaluation of remote devices suitable for these applications, but it appears to the Reviewers that plant engineering staff would need to design the services and handling interfaces and provide various selection criteria. TFA planning to support these kinds of specific facility needs should show a clear hand-off of defined technologies to plant engineering and operations organizations.

TFA Response: Agree. The only tool that this task may involve would be an off-the-shelf grapple that would be modified and tested with TFA funds. The PI has worked directly with DWPF on this and will do so for any other tools that DWPF requests. DWPF will establish functional and performance requirements, review technology selection/designs, handle implementation, and be involved in acceptance testing.

2. Technical Merit

The scope of near term testing presented for this review emphasized a collection of "off the shelf" tools for mechanically breaking the glass in a melter cavity into small enough pieces to be collected/removed by some undefined method. Tooling is dependent to a significant degree on the remote handling equipment that will use it. This aspect was not discussed, but should receive significant attention in developing and selecting optimum tooling. More innovative candidates for causing glass fracture should be assessed and developed to the point of performance comparison with the currently identified tooling options. Methods based on thermal shock cracking through localized or cyclic intensive heating /cooling and those which develop mechanical energy at high frequencies should be explored. These possibilities might provide tools more compatible with remote manipulation and also with applications where access port diameters are limited.

TFA Response: Impact wrenches were used quite successfully for the remote dismantlement of a radioactive melter – if proven technology can be deployed (unless new technology has some significant improvement) then it will probably be considered first. Other candidates, including those recommended in this report, will be considered as enhancements or alternatives if other technologies fail to perform as expected.

The scope of this project does not currently include any consideration of glass removal from a melter where there is an intent to return the melter to service. In discussions

during this project review, SRS staff raised this consideration in the context of potential melter failure due to noble metal sludge accumulation while processing high noble metals feeds. In the near future, waste feeds to DWPF are expected to contain problem levels of noble metals. This is also the case for some of the early HLW feeds in current Hanford vitrification plans. The LFCM melters at DWPF and being designed for Hanford have limited tolerance for noble metal sludge buildup. If noble metal-rich glass could be removed from the melters, it is likely that substantial additional service life could be achieved. This issue seems to be a fruitful area for further exploration and evaluation. A feasibility assessment and cost/benefit analysis would be a logical first step toward defining specific requirements for glass removal capabilities which might fit within this project.

TFA Response: Agree. This is being considered and will be addressed in the DWPF Melter D&D report due 6/1/01 as well as the demonstration report (test plan) due by 8/30/01. This recommendation will be considered when specific tasks are defined during the development plan for FY 2002 work is prepared.

A consideration that should be evaluated in this project is melter design features that impose difficulties for glass removal and disassembly. Such evaluation could result in some melter design requirements and features that considerably improve the ease of glass recovery and melter processing for disposal.

TFA Response: Agree. We recognize the lack of melter design features for remote disassembly/glass removal is an operational and maintenance issue. Several recommendations on this issue will be given in the DWPF Melter disassembly report. Some of this will be covered as well in the separate TFA Melter Improvement Task and the strategic task on ICCM technology.

3. Cost

Planning for this work indicates sensitivity to cost effectiveness and cost reductions in the development work and demonstrations. It is not clear what cost analyses are planned to employ cost-effectiveness considerations in selecting technologies for demonstration and deployment. It may be necessary to establish scenarios or sets of assumptions regarding the facility context for future application of some of the methods.

The funding indicated in the task description summaries provided to Reviewers is a mixture of site funding, ASTD funding and TFA funding. It is not clear what funds will be used for different portions of the program. The Reviewers are concerned that the funding available for this activity may be consumed by equipment preparation for demonstrations, which would involve very little, if any, technology development. TFA funds should be applied in a manner that supports maximum innovation, screening of technical options and development testing leading to the demonstrations.

TFA Response: The detailed budget has been developed and reviewed by the end users. The budget is indeed for demonstrating these technologies and not the actual equipment

that will be used in canyon or other D&D operations of large HLW equipment. Much up front work is going on to determine the candidate technologies (as shown by the numerous paper studies by ORR, WVDP, and SRS). Demonstration of promising candidate technologies in support of recommending methods to the end users is considered an appropriate investment for TFA. TFA will evaluate cost sharing, technology development/demonstration scope, and handoff to the user as it reviews planning for FY 2002 in the detailed development plan for this work.

4. Safety, Health, Environmental Protection, and Risk

Hazards involved in performing development and demonstration tests on glass removal appear to be well understood by the PI and supporting staff. There is experience at both SRS and WVDP with pilot scale melter disassembly operations and also with sectioning full scale canisters of glass (waste simulant) and retrieving glass samples. Also, there is extensive experience in the glass industry in mining glass and disassembling large melters with application of industrial safety standards, which could be reviewed for this application.

TFA Response: Agreed. Various safety analyses will be done before a demonstration. With regards to SRS, off-site work is covered in off-site guidelines.

5. Solution Viability

The general approach taken by this project should result in viable solutions to the problems of glass removal and melter disassembly, if planning and integration are strengthened. Additional integration with remote systems specialists and defined facility contexts are expected. Clarification of disposal options and requirements, integrated for all the sites, will also enhance viability of development results.

TFA Response: Agree. Remote system specialists are currently on-board from WVDP, ORR, and SRS. SRS currently has a robotics contact that is both a part of the core work group at SRS and Robotics. The disposal option issue is covered in previous comments. TFA will evaluate performer selection for this work as it plans for out-year demonstration tasks to ensure performance of work by experts outside of the SRS site, as appropriate.

User Comments/Recommendations and TFA Response

None provided.

F.2 TFA Project Status Reviews

(A9143) HLW Tank Corrosion Control and Monitoring – SRS EIC/Electrochemical Noise (EN) Corrosion Monitoring

TAG Review Comments/Recommendations and TFA Responses

This project was well presented and addresses an important but difficult need with broad HLW tanks application. While the work is promising, the TAG felt there could be an overoptimistic belief in the method's robustness in actual practice (e.g., need to clarify solutions before Raman measurement, fouling of probe window, decontamination issues, etc.). Also, there is a clear need to more aggressively address the problem of converting complicated spectroscopic data to user-usable information that operations can use easily and reliably. PI involvement after any deployment will be required for some time, at least in a troubleshooting/data interpretation mode. The ubiquitous issue of tank sampling representativeness was not explicitly discussed. The TAG also would like to have heard how technology down selection would be made between grab sampling, Raman and Hanford EN approaches. Down select criteria (health safety environment, cost/benefit, operability, etc.) should be defined for meaningful comparison to grab sampling and Hanford EN approaches. It also was unclear to the TAG why the Raman effort apparently is attracting operations interest only at SRS, while more general interest is apparent in EIC. (Refer also to comments below for Hanford EN probe approach.)

TFA Response

Although the robustness of the probe in actual practice is unknown at this point, results from testing of probe components under tank conditions (high pH, radiation, and temperature) and hot cell testing of the probe within archived waste samples strongly indicate that the probe would perform well under tank conditions.

After the deployment process, an SRS Raman technical expert will be involved in the operation and data interpretation of the Raman probe for some time. Eventually, however, an automated software for data acquisition, analysis, and interpretation will be developed so that a technician could operate the system alone.

The probe deployment mechanism allows probe deployment at various depths in tank. Thus, sampling at various regions in the tank will be feasible and allows a representative sampling of the tank.

In addition to SRS, personnel at INEEL and Hanford have expressed interest.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9143) HLW Tank Corrosion Control and Monitoring – Hanford EN Corrosion Monitoring.

TAG Review Comments/Recommendations and TFA Responses

This nicely presented project is a companion to the Raman (EIC) probe effort and represents another approach to solve the large, difficult problem of corrosion monitoring. (Refer also to comments above for Raman probe work for some issues common to both methods.) Multiple user sites clearly are interested in the Hanford EN approach. While the Hanford EN work appears to be promising, issues remain to be resolved. For example, a significant concern raised in earlier reviews is the conversion of massive datasets to information easily used by operations for decision- making. The difficulty in accomplishing this for complicated data such as the Hanford EN is easily underestimated, and uncontrolled false positives very likely would simply make the technology unusable. For this reason alone, heavy end user involvement is necessary now to define the ultimate data presentation format. Also, one TAG member wondered whether this approach has any theoretical applicability to "dry" corrosion. Finally, some TAG sentiment was expressed that this may be a good time to consider transferring Hanford EN technology to industry, including data systems and manufacturing of the devices.

TFA Response

The TFA recognizes the need for refinement in a few more areas before this technology is ready for use at the Hanford site or elsewhere. It takes a great deal of operating time on a working EN system to get it to the point that it can be turned over to operations personnel for use by operations personnel. Hanford is very close to breaking through that barrier. Data from AN-104 and AN-105 appear to be of good quality (free from interference seen on previous systems). These data are being used to build the database of "normal" data necessary to reference future "off-normal" conditions against.

Several other potential probe/electrode design and data management issues will be addressed by an international peer review panel of corrosion monitoring experts that will be convening May 14-16, 2001, at Hanford.

The TFA also recognizes that it is time for user input from all sites to help define how data from these systems can best be presented and used by site operations personnel. Steps are made each year in this area through informal communications between sites and through a formal meeting held every year in conjunction with the National Association of Corrosion Engineer's (NACE) annual conference. Representatives from Hanford, SRS, and INEEL attended this year's meeting. The technology is now at a point where more formal input from potential users is a very good idea.

Regarding the transfer of EN technology to private industry, it is also worth noting that the annual meeting of DOE site EN technology representatives at NACE was attended by several representatives from private industry. Additionally, three papers were presented at the

general conference on Hanford's EN program. Finally, a private company, Highline Engineering and Fabrication, is involved in the design and fabrication of these technologies.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9157) Tank Leak Mitigation

TAG Review Comments/Recommendations and TFA Responses

This project addresses the important complex-wide issue of tank leak management. However, the TAG felt the presentation was overly vague and lacking in specific details. One option presented was to do a comparative deployment of the Russian versus the AEA mixing pumps. However, the TAG reviewers did not endorse this approach, as it doesn't really address the topic of leak mitigation. One TAG member recommended investigating new elastomer coatings for sealing cracks and leaks, and potential contacts were given to the Safety TIM. Other recommendations were to investigate methods to minimize water use and to consider developing a risk decision tool for leak mitigation.

TFA Response

Although the TAG does not endorse the comparative evaluation of the Russian Pulsating Mixer Pump System with the AEAT Power Fluidics Mixer Pump System, such comparisons are deemed important within the context of Hanford's SST Retrieval Program. Enhanced pumping schemes such as the Russian or AEAT systems are designed for better pumping efficiency, with the use of small volumes of liquids, to more rapidly remove wastes from the tank. This serves to reduce the volume available for release to the subsurface environment should a leak occur during retrieval operations and provides a measure of inherent and proactive leak mitigation. It should be noted that alternatives to pursuing the Russian pump for mitigation activities are being investigated, in part as a result of the TAG comments.

It is agreed that a variety of "stop leak" formulations using elastomer coatings are available for deployment in support of tank leak mitigation. While this option is part of the overall tank leak mitigation technology strategy, there are significant challenges to deployment that must be addressed including development of enabling technologies (i.e., crawlers, articulated arms, etc.) to support application of elastomer coatings within Hanford's tanks.

In general, decisions regarding retrieval and lead detection, monitoring, and mitigation system designs are driven by consideration of potential risks to human health and the environment. At Hanford, tank-specific, risk-based decisions are being made with the help of the Retrieval Performance Evaluation (RPE) methodology. The RPE methodology is a deterministic, computer-based tool for supporting retrieval and leak detection, monitoring, and mitigation system designs based on consideration of past tank leaks, potential leakage losses during retrieval operations, and residual waste inventories remaining in tanks following retrieval operations.

The TFA agrees that there needs to be a better, more specific definition of requirements to guide this work and will pursue further discussions with the Hanford SST Program. Further work and funding in this area is on hold pending the outcome of these discussions.

User Review Comments/Recommendations and TFA Responses

Leak detection and mitigation capabilities are needed, as an integral part of all the Hanford SST retrieval operations as mandated by the Tri-Party Agreement.

TFA Response

The TFA recognizes this need and concurs with this comment.

(A9278) Slurry Transfer and Tank Waste Mixing Monitors – Dual Coriolis Slurry Monitoring

TAG Review Comments/Recommendations and TFA Responses

The TAG reviewers found this to be an excellent, well-directed project with good technical basis and tight user connection. TFA clearly has succeeded in working with FIU on a useful tanks-related problem and FIU has clearly developed a good working relationship with the SRS end user. Real-time indication of slurry concentration is essential to effective manipulation of suction or slurry feed system in the Hanford tanks, where solids are initially on the bottom of the tanks. This work will be directly applicable to slurry unloading.

This project takes proven, off-the-shelf technology, combines it into a new system, and focuses it effectively on a real problem. However, the TAG reviewers felt the principal investigator should have mentioned previous work that is directly relevant. That is, similar technology was previously deployed as a bigger system at ORR. FIU has redesigned the system to be more compact. The TAG felt this technology may have detection problems for low solid weight percent fluids, but overall it looks very promising for tank applications. Associated pumps may be most vulnerable to failure.

TFA Response

With respect to crediting prior work at Oak Ridge National Laboratory (ORNL), the TFA and Dual Coriolis Monitoring System (DCMS) Project team agree with the TAG assessment that this technical approach has a good technical basis, tight user connection, and a high probability of success in the field. Although Dr. Srivastava did not discuss the results of the hot field demonstration project of the DCMS at ORNL, the same ORNL principal investigators involved in the ORNL work are also part of the SRS/FIU/ORNL collaborative effort. ORNL has provided support to design the bench scale test loop, set up the experimental test matrix, and determine the accuracy and precision of the DCMS.

Regarding the detection in low solid weight percent fluids, the ORNL field tests demonstrated that the DCMS has a precision (i.e., a level of detection to a change in suspended solids) of about ±0.1 wt% in slurries containing 3-8 wt% suspended solids in the hot Solid Liquid Separation Facility tests (Report, ORNL/TM-2000/184). Similar levels of detection to a change in wt% solids are anticipated for the in-tank prototype DCMS. However, the project team has encountered a larger bias in the accuracy (i.e., as compared to the laboratory method for determining wt% suspended solids) in the bench scale test as compared to expected results at the 1 wt% suspended solids level. The greatest relative bias between the laboratory measurement and DCMS (i.e., 93.5%) occurred during one of the nominal 1 wt% suspended solids test runs. All the other nominal 1 wt% test runs showed a relative bias of 26% or less and all of the other tests between 5-21 wt% showed a relative bias of less than 12%. In spite of the large bias observed in one of the 1 wt% runs, all data complied with the SRS performance requirement that the accuracy of the DCMS measurement would be with in ±2 wt% of the laboratory value. In order to better understand the observed bias in the one test, some of the bench scale test matrix will be run again on the

full-scale prototype in-tank unit. More attention will be paid to achieving thermal equilibrium in the filtrate Coriolis meter during the full-scale tests, which may have been a cause of some of the variability in the bias observed during the bench scale tests. Longer-term operational tests are also planned with the prototype to study the long-term stability of all the DCMS components.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9361) Heel Retrieval from Unobstructed Tanks – INEEL Tank Heel Retrieval

TAG Review Comments/Recommendations and TFA Responses

Good awareness of heel physical properties was demonstrated in the presentation.

The tank closure sequence appears to be well laid out.

The TAG considers the use of grout to assist in heel removal good.

Buoyancy effects of sequential grout addition appear to be well thought out.

Heel chemical properties have not been determined. The PIs should make sure these have no impact on retrieval or closure.

TFA Response

The waste samples will be analyzed for chemical properties. This data will be considered as the final processes are evaluated.

User Review Comments/Recommendations and TFA Responses

This project is an interesting application of off-the-shelf tank cleaning technology (spray ball) to evaluate its applicability/effectiveness to cleaning HLW tanks. The continuing search for, and openness to the evaluation of, promising off-the-shelf technology is an important role for the TFA to continue to play. This project is an excellent example of the TFA fulfilling this role.

Project seems to be well aligned with INEEL user need. PI seems well aware of other technologies being used at other sites and had good reason for choosing technologies, which are specific to INEEL needs. Project appears to have little technology development and does not appear to be of much use to other sites.

Although Idaho's waste is not solid (per se) the site will still benefit from operational knowledge from ORR and SRS.

TFA Response

The TFA concurs and appreciates the feedback.

The technology development aspect of their task is the adaptation of and qualification of commercial technology for use in a HLW tank. It may be applicable to salt dissolution.

The TFA concurs and appreciates the feedback.

(A9362) Salt Cake Dissolution Retrieval

TAG Review Comments/Recommendations and TFA Responses

There appears to be no alternative being considered if this approach fails to meet expectations.

This is an interesting and bold move to try a new approach.

There was some confusion since removal as well as mixing was discussed. The TAG believes this project is solely mixing oriented and retrieval will be by some other means.

The TAG really appreciates that salt cake dissolution is scheduled to be done on plant scale.

It is good to see the salt cake dissolution process being applied to a real tank, scaling up from a laboratory demonstration.

Risk and performance assessment techniques are used to define allowable residual amounts without being fully elucidated.

TFA Response

Regarding the current approach, it is important to note that it is a screening test – if results are positive the effort will go forward. If negative, the schedule allows time for alternate technology selection. This test schedule was advanced one year due to TFA funding and provides significant technical risk reduction in performing testing of the technology that had not originally been funded by the site.

With respect to the third comment, AEAT will test an integral retrieval pump to demonstrate (or not) the feasibility delivering the feed in a pulsating or intermittent transfer.

Important objectives of the U-107/S-112 salt dissolution tests are to see 1) how complete a retrieval action is feasible, then 2) if the residual can then be left behind in the tank. This will be an iterative process.

User Review Comments/Recommendations and TFA Responses

Very high priority item (S102) – Tri-Party Agreement. This is Hanford's first required single shell tank retrieval (not classified as a limit of technology). Requires leak detection monitoring and mitigation support as well (A9157). Planning to use fluidic technology (e.g. AEAT power fluidic – currently supported by TFA and the International Grants program or possibly Russian Power Fluidic).

Very Important (S112) – Tri-Party Agreement – Limit of Technology. Leverages off SRS work done on this concept in the past and Hanford Tank Waste Chemistry Salt Cake

Dissolution work funded by TFA (A9554). U-107 work will use Topographical Mapping System (TMS) used at ORR. Requires leak detection monitoring and mitigation support as well (A9157).

TFA Response

The TFA concurs and appreciates the feedback.

(A9367) Unobstructed Tank Heel Retrieval – SRS Tank Heel Retrieval

TAG Review Comments/Recommendations and TFA Responses

This project involves waste mixing and retrieval. The project appears to be very user oriented and site project specific. However, the presenter made the application sound very easy and not particularly innovative. One then might wonder about the rationale for OST funding the effort.

TFA Response

This activity closely supports the user at SRS. Although it might have sounded like the application is easy, the successful retrieval operations currently underway are the result of a significant team effort over the past two years by TFA developers (SRS, PNNL, and vendors) to modify, combine and apply commercial technologies in a new and untested retrieval system application at SRS. The team has undertaken and resolved many challenges during the development and demonstration process and the results of this work are apparent in the ongoing successful operations of the system. The TFA TAG previously reviewed this work in its earlier development stage in the Fall of 2000. The deployment of these technologies at SRS and lessons learned from the development, demonstration, and deployment are of interest and can benefit future retrieval planning not only at SRS, but also at other DOE sites. Therefore, in TFA's role of providing cross-complex technical assistance and technology transfer, this work will provide broad-based benefit and is viewed within appropriate scope for the program.

The TFA's role this year is to provide technical assistance to retrieval operations, including scale testing of both Flygt mixer and long shaft mixer operations to assist SRS in optimizing their operation strategies. This enables them to get the most out of their equipment. Of special note is the TFA's role in developing an alternate operating strategy in response to the failure of one of three Flygt mixers in Tank 19. Operating the retrieval system in this forced new configuration (two vs three Flygt mixers) required reevaluation of the retrieval operations strategy and developing recommendations for maximizing retrieval performance under new constraints. This was done at PNNL's quarter-scale facility at Hanford. Surprisingly, the best way to get the zeolite to move north was to aim both mixers south and catch the sludge in the counter-flow. This worked well in the field and the elimination of trial and error there saved the limited life of the mixers for production retrieval. Similarly a review of long shaft mixer operations, coupled with scaled testing at PNNL has resulted in recommendations for improving the retrieval efficiency of the mixers without additional capital investment. The disposable crawler is a new concept and will be a first of a kind deployment of this alternative to more expensive crawlers such as the Houdini crawler. A low cost unit has not been available before and the experience in deployment at SRS may have benefit to other sites. In the future innovations within each activity will be included in the presentation guidelines.

User Review Comments/Recommendations and TFA Responses

The project appears to be well aligned with SRS site needs. Information should be useful to other sites like INEEL and SRS. Appears to be good interfacing between PNNL and SRS researchers. This is good.

From the presentation alone, it is not obvious how much more of this project should be funded by TFA versus the site. It is also not obvious that the individual sites know what is going on at the other sites and are taking full advantage of learning possibilities. Improving communication to researchers and users on "tools" available should be a continued high priority for TFA.

SRS is doing real work in the retrieval area. It was mentioned that the Integrated Safety Management System (ISMS) process will be used on the remaining slurry mixer pumps. The proposed TSDS were not referenced at anytime during this presentation. I think speaks to the fact that no user involvement has been included in the development of TSDS.

This project has been a technical success, has met with the approval and support of SRS HLW management, and has been a teaming success between SRS, PNNL and vendors supporting the overall effort.

This effort is also notable as a first at SRS where a totally new waste heel technology developed in partnership with TFA and PNNL has been deployed. The success of this venture has helped to further effect the ongoing paradigm shift at SRS where the involvement of outside partners has been recognized as contributing to a better solution than would likely have otherwise been employed had SRS pursued a solution involving only SRS resources and personnel. This success will serve as an entrée to the TFA's greater recognition and involvement in SRS waste tank remediation activities.

Deployment of tools developed in co-funded program has proceeded successfully. User customer (Westinghouse Savannah River Company [WSRC] and DOE) is very satisfied with the progress made in this program. Program employed a lot of good ad-hoc creative solutions to get over hurdles. Excellent integration of program into line organization schedules and ISMS program.

TFA Response

The TIM is the first line of communication between the Sites on technical progress and experience elsewhere.

TFA funding will depend on scope involving improving technology for future applications and providing technical assistance in resolution of operations issues related to technology performance.

Since this project has already been deployed, a TSDS was not appropriate. TFA considers Users involvement in TSDS development critical and will facilitate this involvement on those

projects where the TSDS is applicable (in the earlier stage). In the case of projects already at or entering deployment stage where site user is responsible to ensure safety reviews/approvals, TFA will not be pursuing TSDS at that late stage.

The TFA concurs and appreciates the feedback.

(A9367) Unobstructed Heel Retrieval – Gunite and Associated Tanks (GAAT) Retrieval

TAG Review Comments/Recommendations and TFA Responses

This is an expedited project that appears to have been well executed. Many good lessons were learned that need to be documented and transferred to other sites. Equipment transfer is currently being planned, but there also is a need to transfer personnel experience.

TFA Response

The TFA concurs with this recommendation. An FY 2001 activity will capture lessons learned and field experiences as the GAAT retrieval operations are closed out. TFA has made an effort to make participating tank sites aware of the availability of not only equipment from the project, but of the staff capabilities and experience that can be tapped to assist in retrieval planning and transferring lessons learned. Technical staff on the project have been working with Hanford SST retrieval project staff to provide the benefit of lessons learned in several meetings/workshops.

User Review Comments/Recommendations and TFA Responses

GAAT approach of deploying a lot of equipment has a good platform for learning about a large number of technologies would perform in a real world environment. The solution to the concern I would have needs to be managed very carefully. The process of identifying technology uses (design functions and expected operating modes) appears adhoc. I expect its not as adhoc as it appears. But, the point was made that until you deploy some of these things you may not know how they are useful. From an operations perspective, this may turn out ok but should bother the technology developers (that is, unless they knew that's what the approach/process for managing this type of technology development process? And revising the documentation?

The project has met ORR user need extremely well. We would not have been able to meet our Comprehensive Environmental Resource Conservation and Liabilities Act (CERCLA) closure of GAAT with out TFA assistance. The close working arrangement between the technology developers, site engineering support, end user, and DOE operations office was critical in the success of the project. I hope there are more successful projects like this in the future. I agree with what appeared to be the TAG's major concern TFA should make sure that ORR experience is used to maximum extent possible by other sites.

The GAAT Project is nearing completion and the team that has worked together for the last seven years will be doing other things. The knowledge from these operations should be institutionalized across the DOE Complex. I would recommend TFA propose to HQ an effort to form a team with Barry Burks as lead. Team members should include some of the GAAT operators and if possible a person (or two) from each site. It would be a great loss to the department to lose this base of operational knowledge.

TFA Response

This year ORNL and PNNL will issue a GAAT lessons learned. Beyond that the TIM in his Technology integration function will endeavor to connect prospective users will GAAT staff having appropriate experience to help the User make an informed selection. In general, TFA seeks to engage end user in early development of functions and requirements and/or other design guidance documents to establish a technical baseline for the development work. Implementing the project with close engagement between the developers and site engineers and operators to provide technical guidance and review of the projects is a model that has been applied successfully at ORNL and SRS, and is now underway with the Hanford SST retrieval projects.

In addition, TFA has sponsored meetings between GAAT and Hanford project personnel. Barry Burks will continue to be an available resource to the program, through his role as the Robotics interface to TFA.

(A9367) Unobstructed Tank Heel Retrieval – Hanford SST Retrieval

TAG Review Comments/Recommendations and TFA Responses

A goal of 99% removal by volume was stated, but the basis was unsupported.

It is unclear if the light duty utility arm (LDUA) will be used, or should be, in the project.

It also is unclear if major issues in routing waste from C-104 to AY-101, a distance of 1300 feet, have been thought out thoroughly.

This is a good project in its initial stages, and will be followed closely by TAG.

Don't forget criticality issues!

TFA Response

This goal of 99% removal by volume is from the Hanford Federal Facility Agreement.

The use of the LDUA in this project has not yet been decided.

Regarding issues associated with routing of waste, the existing recalculating four-inch lines that were used for C-106 sluicing retrieval are acceptable and will be used for this activity.

Criticality issues are being addressed through the technical design and safety assessment.

User Review Comments/Recommendations and TFA Responses

Very high priority item (Crawler, C104) – Tri Party Agreement. Limit of technology. Benefits from TFA sponsored tank retrieval at ORNL (Gunite tanks) and former TFA sponsored (co-funded) Hanford Tanks Initiative. Requires leak detection monitoring and mitigation support as well (A9157).

TFA Response

The TFA concurs and appreciates the feedback.

(A9376) Waste Transfer Line Plugging Prevention and Unplugging Methods

TAG Review Comments/Recommendations and TFA Responses

The TAG reviewers concluded that TFA has done an excellent job of working with FIU to focus work on the important problem of transfer line unplugging. The presentation indicated that a good collaboration is in place involving site personnel. The project appears to be well planned and very promising in terms of evaluating a number of useful alternative solutions for different applications at a test bed. There appears to be good transfer of technology from the oilfield pipeline industry.

The TAG reviewers felt the project might be improved by even stronger user site interactions, use of more realistic simulants (such as gels and high-base, high-salt solutions) and out-year study of re-suspension. There also is a need to address and develop contingency plan for the safety issue created if a crawler gets stuck in a pipe. Pipe corrosion could be a concern with some of the technologies, especially those that use high pressures or pulsed flow. The hydraulics modeling is a good use of existing technology applied to this problem, but the principal investigator should involve site-user engineers to a greater extent in the experimental design. There also is a need to develop an explicit plan to transfer the project results to site-user engineers in the field.

The TAG reviewers also wondered whether FIU is collaborating with entities such as ORNL that also are testing slurry monitoring technologies. It also was unclear why blockage work in FY 2003 is going back to the lab after FY 2001 and FY 2002 activities were in the field.

TFA Response

In FY 2001, the TFA is working closely with Hanford to develop the specifications for a realistic Hanford simulant.

Salt solution gelling issues are being worked by FIU as part of a different project under the leadership of the Pretreatment TIM and ORNL. The unplugging activity will use physical properties of gels learned there to create a non-toxic gel simulant for testing mechanical unplugging equipment in the outside test bed.

Project results are being communicated to the users in the field through reports, meetings, and monthly highlights that are published on the TFA website.

The flow loop efforts concentrate on slurry flow behavior as it relates to critical velocity and expected pressure drop. This is part of the plugging prevention effort. The field and laboratory bench testing are parallel activities and are being carried out in an iterative manner to test both in the laboratory and at larger scale in the field to expand the database of information to support development of recommendations.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9554) Hanford Tank Waste Chemistry - SRS 2H Evaporator.

TAG Review Comments/Recommendations and TFA Responses

This was another excellent presentation on an urgent tanks-related technology problem. Existing bottoms will be chemically removed this summer from evaporators concentrating SRS tanks liquids. The real technology issue is how to avoid solids formation in the future by defining a proper operating environment including feed composition management. This project appears to be well focused on this issue. However, there was some TAG skepticism that, at least in the near term, modeling alone can be made robust enough for this purpose. More likely, some combination of empirical tests and modeling will be necessary for some time - maybe a long time. There also was some TAG uncertainty about whether outside industrial competency might be available and could be engaged better by the project.

TFA Response

The TFA agrees that modeling alone is not sufficient in the near-term. Accordingly, the bulk of the project activities are laboratory studies focused on understanding the phenomena. Next year, modeling of the solids formation will be conducted only as a means of understanding, in a logical format, the results being experienced. Regarding outside competency, the site and TFA have brought in experts from the aluminum and petroleum industries and universities (including a university from Australia). In addition, an in-depth technical review of the work by these experts is scheduled in June 2001. TFA plans to include a member of the TAG (Major Thompson) in this review.

User Review Comments/Recommendations and TFA Responses

Good progress in technical identification of problem and definition of deposition species and kinetics. Work has a high potential for developing a solution for user that is well founded on underlying science. The scope and schedule of the work is well tied to user requirements.

Why not establish an understanding of sensitivity before investing in evaporator fluid dynamics (i.e. what does that information buy me)? Uncertainty/sensitivity values should drive future efforts.

SRS – Presentation suggests lack of systematic technical problem definition sufficient to support a program for careful, thorough solution (development of corrective and preventive action) – and understanding to what extent Hanford may have a similar problem.

ORR – Work looks very good on simulants – perhaps more verification/validation should be done with real waste.

Walt's comments emphasize the complexity of the problem. Walt's suggestion of moving towards gathering data with pilot scale evaporator seems to be a good idea.

TFA Response

The TFA concurs and appreciates the feedback.

During FY 2001, two tasks at SRS (Formation Chemistry and Deposit Testing) and one effort at ORR (Initial Scoping Tests) are conducting sensitivity tests. Additional tests are planned for next year. Preliminary results have shown that temperature is a key variable in the formation of the deposits. Unfortunately, information on the temperature gradients in the evaporator is not available. It should also be noted that one side of the evaporator is covered with the deposits while the other side is relatively clean. In order to determine the effects of temperature, mass transfer, and fluid dynamics in the evaporator, a model must be developed based on limited operational data.

The TFA has scheduled an in-depth review at SRS in June and will assess this potential issue. It is important to note that the objectives of this presentation were to provide an overview and status of the SRS evaporator problem and to discuss the status of related TFA funded projects. Several other research efforts being funded by the users at SRS were not discussed.

Actual deposits from the evaporator pot and gravity drain line were obtained and characterized at SRS. Whenever possible, the test results on actual deposits have been used to successfully validate the simulant formulations and results. Key observations from the simulant tests are now used to develop the test plans for the tests with real deposits.

Scoping tests suggest that factors related to scale-up need to be addressed to solve this problem.

(A9554) Hanford Tank Waste Chemistry - Waste Transfer/Solids Formation

TAG Review Comments/Recommendations and TFA Responses

This is a complex, multifaceted project involving several investigators working on different problems with a common focus. Interest and participation in this work goes well beyond Hanford. The TAG believes the problems being addressed are real and of high priority, the investigators are top notch and solid progress is being made on all fronts. Excellent cooperation and communications is apparent between site users, national laboratories, industry and universities. Continued work is clearly warranted and some TAG reviews say "critical" to the cleanup effort.

- Are the plugging results scaleable for pipelines of different diameter?

- The use of Neural Nets for predicting solids formation is seen as problematic. Neural Net models are poor at extrapolating and prone to over fitting data. Validation of the final model will be critical.

- It was not explained how the validated models will be used in real time to prevent pipeline plugging.

TFA Response

The scaleability of plugging results for pipelines of different diameters is being addressed in the tests at FIU, in the modeling at MSU, and in the analysis of the experimental data. The test setups at MSU and FIU use pipe diameters from 1/4-inch to 1-inch in diameter. The FIU work explicitly includes an examination of the effect of diameter on plugging. The computational fluid dynamics model at MSU will allow us to examine this question computationally. Finally, data are reduced to dimensionless form to identify variant behaviors.

Waste transport models will be used in a number of ways by the site throughout its development cycle. As the model is being developed, the validity of some parts of the standard site methods are being checked and improved where appropriate. The effect of the slurry particle-size distribution on the standard method for calculating critical velocity is one such study. The model will also be used to confirm site transport design calculations. As the transport model is further developed it will be used by the site to prior to a transfer, along with other methods, to evaluate individual proposed transfers to make a yes/no determination of the potential for plugging. When fully developed, the transport model will assist the site in interpreting field data, predicting when and where plugs may form, and analyzing recovery plans for existing plugs.

User Review Comments/Recommendations and TFA Responses

Good mix of simulants/modeling and actual tank waste with emphasis on actual tank waste. Good experimental base – looking at nine tanks representing all the Hanford salt cake.

Recommend continued funding in FY 2002 to complete three tanks remaining of the nine tanks. Need to ensure constituents of concern are analyzed, although they are expensive. Need to ensure that equilibrium tests can be translated into field retrieval (probably non equilibrium).

TFA Response

The TFA concurs with the recommendation and will factor it into the future planning for the project. In addition, the TFA is reviewing the difficult issue on how the equilibrium data can be transferred adequately.

A9554 Hanford Tank Waste Chemistry - Saltcake Dissolution

TAG Review Comments/Recommendations and TFA Responses

Dan Herting is an excellent experimenter and his collaboration with the Environmental Simulation Program (ESP) modelers at MSU is strong. Since a limited number of waste compositions will be used to cover the entire range of tank waste compositions, some TAG members felt that a TAG review of the selected test wastes would be valuable to this effort.

For deployment of the ESP models in the future, the waste composition data fed to the model as input will be uncertain (confidence limits or ranges should be provided). Therefore, ESP model outputs should include confidence limits that reflect the uncertainties of the input data as they propagate through the model.

Problems with modeling double salt behavior should be solved by further experiments.

When the ESP model predicts solids formation in real life, what will be the mitigation action?

In operation, continuous salt cake leaching will generate continuously changing compositions of dissolved salts, suggesting a need for real-time measurements. Consideration should be given to development of sensors for ions that may be problematic.

TFA Response

The TFA concurs with the TAG's recommendation of a TAG review of the selected test wastes. In fact, a technical review of the project by the TAG was conducted May 1-2, 2001, at Hanford. A detailed account of the salt cake types selected and tested was presented to the TAG.

The TFA concurs with the recommendation and will factor confidence limits for ESP model outputs into future developments. The best basis inventory contains uncertainties for the major constituents and not all of these components play a decided role. Nitrite and chloride are not observed in the solid phase. Oxalate is a minor component and while found in the solid phase would not significantly impact the prediction of double salts. Major components such as phosphate, fluoride, nitrate, sulfate and carbonate are more likely to be present in the solid phase. Uncertainties from the best basis inventory can be used to estimate upper and lower bounds on the relative amounts of these species present. Formulation of the process for examining these issues must also consider downstream processes where specific components, such as sulfate, may play critical roles.

The TFA is actively pursuing further experiments on double salt behavior. Data has been obtained for the Na-F-PO_4-OH and Na-F-SO_4-OH systems. Work is in progress on Na-CO_3-SO_4-OH and the Na-F-NO_3-OH systems (the later does not form a double salt). Further work on Na-F-PO_4-OH and Na-F-SO_4-OH both with added NO_3 are planned for FY 2002.

When ESP model predictions reflect solids formation, the mitigation action will be determined by the user. Options include (1) allowing the solids to form in the receiver tank, recognizing the impact that might have downstream, and (2) carefully selecting one receiver tank for the initial high-sodium liquid retrieved during the first part of the retrieval process and a different receiver tank for the low-sodium/high-phosphate (or sulfate or oxalate etc.) liquid retrieved during the later part of the process. Downstream precipitation could be avoided by judicious selection of the receiver tank.

The TFA concurs with the recommendation to consider development of sensors for problematic ions. In fact, such consideration is in process under TFA's MYTR A9143, HLW Tank Corrosion Control and Monitoring – SRS EIC/EN Corrosion Monitoring, as one example.

User Review Comments/Recommendations and TFA Responses

Future work should emphasize dissolution of long-lived mobile radionuclide and closure-significant hazardous (e.g., nitrate) constituents. Conclusions of work should include potential methods to reduce volumes required for retrieval without incurring plugging.

How does ESP predict the evaporation of the liquid? Scenario: S-Tank wastes are consolidated and evaporated - does ESP provide confidence in solid formation? What about establishing uncertainty (ESP predicts +/-x%)? Can Hanford expect similar problems in our evaporator (WTP evaporator)? Will gibbsite clear the ultrafilters?

Goal: establish ESP… excellent, very much needed. Recommend continue support work through the remainder of nine salt cake tanks. If Dan Herting does non-equilibrium tests to support field retrieval conditions, it would be desirable to explore how ESP could be adapted to predict these results.

TFA Response

The TFA concurs with the recommendation. In fact, the TFA work at MSU and ORNL are currently investigating the potential for pipeline plugs during the retrieval of salt cake.

This is one of the "what-ifs" being studied by TFA. Hanford can have the same problem if there is a source of Si. This should not be a problem if the off gas stream from the vitrifier is not mixed with the high Al waste in the tank farm. Gibbsite will not clear the ultrafilters. However, the stream is at saturation in Al. Any change in the conditions such as change in concentration or temperature can cause Al to precipitate downstream of the filters. This has been shown to be a problem on the bed of crystalline silicotitanate (CST) for the SRTC tests.

The TFA concurs with the recommendations and will factor them into the future planning for the project. It is important to note that ESP can do dynamic simulations, but the kinetic parameters required need to be developed from data.

(A9586) CIF Evaporator - Waste Water Triad

TAG Review Comments/Recommendations and TFA Responses

This essentially completed project consists of the deployment of a triad of tanks-related treatment technologies at ORNL. This work represents a success story for TFA in integrating and applying known technologies to a specific challenging new environment. To complete the project, the TAG believes it is now necessary to fully document the good, bad and indifferent aspects of this effort. In particular, the convenience (or lack thereof) of maintainability and reliability in operations should be highlighted. Flexibility, redundancy of design, and overall project management aspects that contributed to the project's success also should be emphasized from both user and TFA perspectives.

TFA Response

The TFA concurs with the recommendation - data for the five operating campaigns of the TRIAD systems performed in FY 2000 is being compiled. A summary report was published in FY 2000 that provided performance data for two of the FY 2000 campaigns in which all three of the TRIAD systems (ion-exchange, evaporation, filtration) were used. Other FY 2000 campaigns used just two of the three unit operations. This report will be expanded to include these three campaigns with lessons learned including the important aspects of the program described in the TAG comments. The lessons learned will not be limited to FY 2000 experience, but will also recount pertinent experiences from earlier operations.

User Review Comments/Recommendations and TFA Responses

None provided.

Melter Strategic Plan

TAG Review Comments/Recommendations and TFA Responses

Overall, there appears to be a comprehensive and thoughtful portfolio of programs that address the key present and future melting issues with sound technical programs. A few specific points of clarification were raised:

- A waste loading of 1% was reported to save $200M at SRS. What is the basis for this? What is the total cost of a log based on 25% and 26% wt% loading?

- What work is planned to find glasses with higher waste loadings, melted at higher temperatures, that would crystallize or phase separate on cooling?

- Can feed composition to a melter be changed for a particular tank waste to maximize the waste loading? For how small a batch would it be practical to develop a specific glass formulation?

- The previous INEEL baseline included calcination of SBW, which would proceed to the calcine bins. In the present baseline for vitrification of SBW, would there be any advantage gained by adding some calcine to the SBW melter feed?

TFA Response

The basis is a draft analysis performed by DWPF Engineering. The total cost is $250K.

For INEEL, the site need statements were open enough for the TFA to include work on high waste loadings for calcine (a fluorine containing phases such as CaF_2 precipitate upon cooling and appear benign with respect to durability). With the encouraging results, Idaho has been supportive and that work is continuing. For SBW, we are also determining what segregates with the sulfate salts to see if that is an option for higher waste loading. However, the Russians indicated in their waste some radionuclides segregate with the sulfate so that is a long shot. Some work was performed last year to get a feel for the incentive for Hanford and Savannah River wastes and as waste loading increased we observed separate glass phase or nepheline with negative effects on durability. However, TFA believes there is still an incentive to investigate this subject and submitted a scope that was included in the recent Applied Research Call from the National Energy Technology Laboratory (NETL) to both industries and laboratories. If suitable responses are not received, TFA will request the management team reconsider it for a strategic task. As part of the recent advanced melter evaluation task, the relative benefit of allowing secondary phase formation in Hanford HLW glasses was assessed.

Yes, TFA is considering changing the frit, which modifies the composition of the melter feed in order to increase melt rate. We can also do it to improve waste loading. It is important to note that all of these parameters are interrelated and cannot be changed without a full glass-melter system evaluation. It is practical to change on a macrobatch basis which nominally

lasts 2 to 3 years and provides production of ~500-600 canisters. The Hanford baseline technology assumes that glass composition will be "tailored" to individual HLW feed compositions. Each feed contains on the order of 150 MT of HLW.

The glass chemistry and processing aspects of blending these two streams have not been fully addressed. The addition of a calcine waste to SBW would add several complications including (1) it hasn't yet been determined if SBW will go to the repository or WIPP, adding calcine would make it HLW, possibly increasing disposal costs, and (2) SBW treatment is on an accelerated schedule, adding a higher dose, solid waste to the flowsheet will complicate design and will delay the work on SBW. Funding is limited; even the integration of calcine into the SBW vitrification plant is not currently funded to allow essential work on SBW to be completed.

User Review Comments/Recommendations and TFA Responses

This work is vital to the INEEL path forward. The cold crucible work has great potential for Idaho. Idaho is currently working as a baseline the joule-heated liquid feed. The decision to go joule-heated was from the TFA review this last summer. This decision needs to be reevaluated by the TFA. I believe this work opens the door to reevaluate.

If the ICCM technology begins to show promise, what is the feasibility of moving this direction with Hanford or even with DWPF? Seems that these designs/facilities are too far along to make this change.

One of the big decisions making issues from an operations perspective at WVDP has been the risk of a melter shutdown/restart. One of the apparent advantages of the cold crucible technology is that this is not an issue. This should be kept in mind as a large potential advantage from an overall systems operating perspective.

TFA Response

The TFA concurs with the recommendation and will incorporate it into the melter strategy. Experts from TFA's TAG who participated in the INEEL HLW Treatment Alternatives Review will be considered for involvement in the reevaluation if it is pursued.

For both DWPF and Hanford, the ICCM technology could provide an advantage as melters are replaced.

The TFA concurs with the recommendation and will incorporate this potential advantage into the strategy.

Argentina Immobilization

TAG Review Comments/Recommendations and TFA Responses

This project is a "good neighbor" project intended to provide assistance for a nuclear-related South American problem. While TAG appreciates the policy mandate for international collaboration by TFA, it is not clear why this particular project is considered a TFA (vs TMFA) project, or why it was chosen over other possible international projects. It also is not clear why this particular technical approach to the problem was chosen, compared to other alternatives that already are available in other countries. Likewise, the technological benefit back to the U.S. is unclear. Perhaps most troublesome to the TAG is the implication that the Argentina waste should be managed by an expensive, complicated technology that probably would not be considered acceptable elsewhere. The TAG recommends that when TFA is asked to provide international help in the future, reasonable cost, widely accepted technology options that have mutual benefit be emphasized.

TFA Response

There are several items to consider when supporting international clients that are different from U. S. clients. One is that requirements and regulatory constraints in other countries are different from those of the U. S. and melter technology is more widely used. The Russians are using the ICCM for the same application (Ion exchange resins) that has been evaluated in this task; the Italians are preparing to utilize the ICCM technology for reactor resin vitrification to begin in FY 2003. The Argentines are considering grout as well as glass, and that is the current favored option; however, they are concerned that the levels of radioactivity and the final volume of the waste may push them to vitirification. It is due to that evaluation that the Argentines have requested U. S. support for the following reasons:

1. The U. S. already has the expertise and infrastructure in place to evaluate melters.
2. It would be very costly for the Argentines to develop and implement the necessary infrastructure.
3. They want technical input that is more objective than that provided by melter vendors.
4. The process decision is to be made in the next couple of years.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9773) Improve Waste Loading in HLW Glass - INEEL Glass Formulations Development

TAG Review Comments/Recommendations and TFA Responses

This work is directly related to the INEEL need to develop effective glass formulations. Excellent scoping work has been done to support an initial basis for INEEL to assess viability of both SBW and calcine vitrification. Investigation of crystallization versus durability is very appropriate to improving waste loading and could save significant money.

This work has been performed quite efficiently to define viable glass formulations without a lot of funding, building on data/experience/capabilities established for SRS and Hanford glasses using very preliminary INEEL waste feed. Because INEEL waste feed compositions are very preliminary, there is high uncertainty in the achievable waste loading and formulations.

- Additional work is needed on
  - Expanded feed compositions for calcine direct vitrification to assist with selecting separations or direct vitrification treatment options;
  - Composition ranges or additives to address the solubility of sulfate in glass and volatility from cold cap;
  - Reassessment of formulations and composition variability ranges when improved SBW characterization data yield updated SBW feed compositions. This information should be used for planned melter tests;
  - Direct vitrification calcine feeds that contain tank heels (e.g., what effect will blending scenarios have on waste loading and formulations?); and
  - Aluminum-rich calcine (separate feed stream, Al-rich-Zr-rich calcine blend).

- TFA planning should recognize that additional formulation work for SRS, INEEL, and potential Hanford will be needed if the Melter Study and EM-RW interface establish a formal basis to relax crystallization limits currently applied to HLW glass formulations and associated waste loading limits.

- This project relates the significance of a higher melter temperature to advantageous operations. However, the specific effects on waste loading, cesium increase in the off-gas and integrity of the glass are not quantified.

- Glass property targets are all related to JHCM. A target of 2 Pascals viscosity may not be appropriate for Cold Crucible Melter (CCM). There is a need to look at glass form for CCM. There is no reason to assume that 1 Pascal glass viscosity will cause dramatic melter corrosion. Generally corrosion is inversely proportional to viscosity.

- Was boron-free glass considered (to increase viscosity)? What durability could be expected?

- Can sulfate be volatilized with reducing agents?

- The TAG recommends continuation of this work focusing on SBW, because all flowsheets include a vitrification component.

- The presentation gave interesting information on glass degradation by the higher quantities of waste contents, like Na, Al, Zr, SOx,and F. Is the waste loading and the product volume so dependent on these components that an operating recipe cannot exceed a nominal loading, like 25 weight percent?

- There was much discussion on product glass integrity. How important is glass integrity? Is it important for the repository criteria? Is good integrity a DOE decision for some reason other than repository criteria?

TFA Response

The TFA concurs with the additional work recommended by the TAG and has incorporated this work into the development work going on in FY 2001-FY 2003. However, only formulation work is supported by Idaho for direct vitrification of calcine for FY 2001-02. Melter testing will resume in FY 2003 for calcine. The priority interest is providing basic data for Sodium Bearing Waste.

The TFA agrees that its planning should recognize the additional formulation work for SRS, INEEL, and potentially Hanford. Some work is underway for Idaho calcine in this arena, since the crystallization limits are more self-imposed than required. There has also been an "Applied Research Request for Proposal" issued by NETL to support building a solid technical basis for allowing a final glass product with a higher benign crystal content. One of the constraints that has historically limited crystal content has been the resulting higher viscosities in the melter. With the consideration of higher temperature melters, some of the operating issues become less significant.

Regarding the TAG's comment about the specific effects on waste loading, cesium increase in the off-gas, and integrity of the glass not being quantified, this task has focused on the advantages of higher temperature to waste loading. The operational issues such as impact to semi-volatiles, off-gas issues, power delivery, pouring, etc. are covered in an active strategic task utilizing expertise in Russia and France to perform engineering scale testing

The TFA concurs with the recommendation to look at glass form for CCM. The initial evaluation will occur in FY 2001 and continue into FY 2002 in a collaborative effort with the French to begin as soon as international agreements can be put in place.

Boron free glasses have not been seriously considered to date for existing HLW glasses, since the requirements state we will use a borosilicate glass. However, as we move to the newer technologies we are opening the door the other glass systems such as aluminophosphate glasses to enhance sulfate solubility and others. However, measuring durability will require more development since the standard approaches developed for borosilicate glasses are not directly applicable to other systems. These issues will have to be addressed.

The TFA believes that sulfate can be volatilized with reducing agents that are being evaluated in support of design needs for Idaho. If not, we do think that redox and composition can affect the partitioning of sulfate between the glass and the gas, and a salt phase may be avoided.

The TFA concurs with the TAG's recommendation that continuation of the work focus on SBW - work is in progress.

The waste loading is dependent on Na, Al, Zr, SO_x and F. However, they affect waste loading and order depending on their initial composition. For example, with SBW, the sulfate is initially limiting, if we solve that problem, then sodium becomes limiting due to durability. The waste loadings can go considerably beyond 25 w%.

Good integrity is required by the DOE and the TFA program to ensure meeting the glass integrity requirements. The DOE requirements are consistent with those of the Europe; however, the approaches to evaluating glass durability differ. It is important to consider that the internal repository design and the performance assessment for the repository is still in progress.

User Review Comments/Recommendations and TFA Responses

None provided.

(A9777) Remote Disassembly of HLW Melters and Other Processing Equipment – WV Vitrification Expended Materials (ASTD)

TAG Review Comments/Recommendations and TFA Responses

Voiding in canister is a concern due to poor flow during glass addition.

Other vitrification sites should review this work.

Use of the WIR alternative should be developed further.

No generic merits to be obtained from this work were given.

The remote loading concept was not discussed.

It is not clear how this project will benefit other sites.

The project was poorly presented.

The TFA collaboration with WVDP is good for both parties.

Need TFA-wide look at canisters that will contain "Expended Materials", including material from D&D.

WIR issues in this area need to be examined more and more.

There is a need for close coordination with Joint Committee for Radioactive Waste Management (JCRWM) regarding disposal of equipment.

No specific technical issues "to be resolved" were mentioned.

Early work at PNNL on canister inserts may be of value to this effort.

One TAG member is unclear why chunks of HLW needs to be encapsulated in glass.

Success depends upon glass compatibility with foreign material.

TFA Response

It is important to note that this presentation was intended as a status briefing on an ongoing ASTD technology development project, not as a TFA technical response review. Therefore, the presentation did not provide the level of detail presented in other sessions. As an ASTD project, the scope and direction is established in accordance with the proposal provided by the site user and their subsequent deployment plan. TFA was not involved in the planning or establishment of this scope, but provides technical integration support during implementation.

WVDP plans to follow up on the recommendation to review the Pu can-in-can tests and guidelines to avoid voiding. TFA has determined that there is no Waste Acceptance Product Specification (WAPS) requirement on voiding. The driving requirement is on fill height and testing of insertion techniques were performed in a vendor shop simulating remote operations.

Again, this project was presented at the Midyear to provide an opportunity to share lessons learned with other sites. This work is expected to be beneficial to other sites in two aspects. First, WVDP is preparing a WIR procedure (compliant with DOE Order 435.1) that, if approved, will be useful to other sites. Second, WVDP has demonstrated equipment and procedures to insert HLW glass contaminated equipment into glass canisters for disposal. Through its technical assistance and integration roles, TFA will continue to disseminate this type of information through meetings, highlights and other channels.

The WIR procedure is being developed and issues resolved consistent with DOE Order 435.1. WVDP has already gained WIR acceptance for equipment that has not been in contact with actual glass.

This task is an ASTD task and was not presented for detailed review by the TAG. There are background documents such as the ASTD proposal and deployment plan that provide more details on the rationale for why it was funded by ASTD. These documents could be provided in the future if requested by the TAG. As an ASTD project, it is focused on engineering systems for deployment versus technology development. Note for operating sites: The fact that equipment has been developed and will be demonstrated for inserting spent equipment into a canister may be immediately beneficial to Savannah River as they cleanup their melt cell of large quantities of glass and other dust and will need a way to dispose of this material. A working application of a WIR process will also be beneficial to other HLW sites.

The slides had only a schematic included and the discussion was light due to the short time available to discuss a multiyear task. The concept uses a basket (right circular cylinder) that can be grabbed and place with an overhead maintenance crane. The concept has been tested at a vendor shop in totally remote operation, but not in radioactive service.

The two most significant contributions for broad application are (1) the effective implementation of the 435.1WIR process, and (2) the canister insertion technique and procedures that can be adapted to other HLW canisters.

As noted above, this presentation was intended as a brief status update to set the stage for the technical progress review of the other tasks on glass removal and D&D of failed melter equipment. The amount of time allotted was not sufficient for an in-depth presentation and discussion of a multi-year project.

The TFA agrees that collaboration with WVDP is beneficial to the parties.

Each site is at vastly different stages in addressing expended materials and the site have not yet defined specific technology needs in this area. SRS is currently looking at putting

experimental glass (with data to back up its pedigree) in existing canisters; needs for disposal of the melt cell floor glass and other dust have not been determined. Idaho and Hanford are not in a position to define needs at this time.

TFA agrees that WIR issues in this area need to be examined more and is addressing the issue as discussed above.

TFA agrees that there is a need for close coordination with JCRWM in the area of disposal of equipment and is addressing the issue.

This task is nearing the end of its scope, with the key items being to implement size reduction for ancillary equipment (jumpers, etc.), which have been completed. In addition, the second task has been completed, which involved development of a process for inserting HLW glass, and materials with adhering HLW glass, into canisters for encapsulation into glass. The only issue left to be resolved is the implementation of the DOE Order 435.1 WIR process.

TFA is not currently funding this activity, as EM-50 funding was expended in FY 2000 in accordance with the ASTD deployment plan. It is completely site funded in FY 2001. The WVDP objectives have been met and the scope and funding are finished at the end of FY 2001.

This is a misunderstanding of the information that was presented. Actual HLW glass does not need to be encapsulated in glass. This project is focused on equipment in which HLW glass has adhered.

That is correct and the scope of the work includes only materials that have been determined to be compatible with HWL glass. The foreign materials have already been in contact with glass during processing. Pedigrees have been established from the facility design.

User Review Comments/Recommendations and TFA Responses

None provided.

Strategic Projects

TAG Review Comments/Recommendations and TFA Responses

No TAG review of technical merits or progress was possible because of limited information presented.

The TAG expressed concern over how these projects were selected. For example, what selection process was used? Was TAG input used?

What does TFA want strategic projects to achieve? Is there a plan, with clearly stated goals?

It appears to the TAG that the retrieval from leaking tanks projects is redundant to other ongoing work supported by TFA.

The relationship of these projects to gap analysis is unclear.

Without effective user involvement and buy-in, the TAG believes it is likely these efforts will fail.

New cold crucible work should augment Russian/French work. Focus should be on SBW first and then move into glass.

TFA Response

Due to the late start of the new strategic projects no technical progress worthy of TAG review was available at the mid-year. However, a technical review of strategic projects is very important and TFA has committed to the management team to critically review these projects before year's end.

The objectives of strategic tasks is to begin addressing site needs that are longer term in nature and consequently don't fair very well in the prioritization in the core program. The needs may arise from needs submitted directly by the site, derived from site S&T road mapping or gap analysis, from needs brought forward from expert panels (e.g. National Academy of Sciences/National Research Council, Strategic Laboratory Council), or from needs determined by the TFA technical team while working with site personnel during needs/response development or project execution.

The needs addressed by strategic tasks include: (1) "gaps" that need to be resolved over a longer time frame (e.g. <5yrs.) and (2) breakthrough opportunities, investments in technology alternatives that could significantly reduce cost or schedule. Strategic tasks are not expected to be the funding source to bring any of the needs to deployment. Strategic tasks will emphasize smaller investments to validate incentive and assess feasibility of technical approaches. The intent is that once incentive is established and a viable technical path shown then the major development will be co-funded in the core program.

User Review Comments/Recommendations and TFA Responses

I agree that strategic initiatives are needed to keep a balanced portfolio. However, it appears that many of the ideas that are brought forward are truly long-term and have the ability to have major impacts. Many are still incremental medium term activities that the TIMs or individual sites would like to promote. The crosscutting program and Environmental Management Science Program (EMSP) needs meet the criteria for strategic initiatives better. We also need to make sure user approval of these initiatives is obtained.

The TAG seems to be a little wound up about the strategic initiatives. Seems like they need to be informed on how these were set. They need to be reminded that they will not find strong cofunding because these are initiatives that the sites (representatives and USG's) need a long rage perspective. The sites, especially budgets, are very much focused on near term issues. This is a great avenue to work on these long-range issues.

TFA Response

Strategic tasks are used to address truly long term opportunities (10+ yrs) and medium term opportunities (~5 yrs). Both are needed because the core program focuses on short-term (1-3 yrs). EMSP is well suited to truly long term where science advances are needed. The only way medium term opportunities can be funded is through strategic tasks. The cross- cutting programs are used to execute these where appropriate. For example two of the current five strategic tasks are implemented through ESP.

The TFA concurs that user support is necessary. In fact, the policy now is that the TFA Management team which includes the users' representatives must approve each project before it is budgeted.

The TFA concurs with the recommendation and will revisit the strategic investment identification and selection process (including co-funding) with the TAG when they are involved in the next review of these projects later in the year.

F.3 EMSP Project Status Reviews

(73748) New Metal Niobate and Silicotitanate Ion Exchangers Development

TAG Review Comments/Recommendations and TFA Responses

This project is an excellent example of a well-chosen and executed EMSP project with excellent basic science and good potential long-term tie to applications. A powerful collaborative team has been assembled and the PI is well connected to critical site users and technologists. Highly productive in terms of scientific output. This would be a good project to analyze for how to do EMSP well! The work develops the underlying technical basis of CST application and provides an immediate technical resource for troubleshooting if problems arise during any CST deployment, or if expert opinion needed on underlying science. The potential for even better materials also could arise from the work. PI should clarify question about acid concentrations used in some tests.

TFA Response

The TFA agrees that this EMSP project has strong potential to develop new waste form materials, and is very pleased with the support and expertise the EMSP PIs have provided to critical TFA programs regarding application of CSTs (i.e. Salt Processing Project [SPP] project). However, it must be pointed out that the EMSP project is focused on application of CST in a very different way than is being currently investigated in the SPP project. The current application being investigated uses the ion exchange capability of CST to remove Cs to be later incorporated into borosilicate glass as a final waste form. The EMSP research is focused on converting CSTs thermally or hydrothermally into a final waste form themselves. Performance as an ion exchanger is not part of the EMSP research. The most valuable interaction with this EMSP project has been through direct funding to the PIs to use their expertise to answer relevant questions regarding CST fouling and stability. The interaction has been very valuable, but unless CST can be accepted as a final waste form this EMSP project still isn't an ideal example.

User Review Comments/Recommendations and TFA Responses

Very impressive presentation. However I do not have the scientific background to determine any flaws or oversights in the technical work perfumed. I leave it to the TAG and EMSP programs to judge the technical merit of this work. That said, the results of the work presented appear very promising. Short of technical issues that may be identified by others, continuation of this project appears warranted. The comparison of Cs-loaded CST by direct thermal conversion into a ceramic or glass waste form – if it pans out – would be a big plus for the EM program.

TFA Response

The TFA concurs and appreciates the feedback. This could be attractive as an alternative waste form. However, as with iron phosphate glasses, ability to deploy will depend on getting alternative waste forms considered by RW.

(73749) Predictive Modeling of Phase Partitioning During Tank Processing

TAG Review Comments/Recommendations and TFA Responses

This was a well-presented project by an outstanding PI representing a powerful scientific collaborative team. The PIs are well connected to site users and represent an important site technology capability. High productivity was clearly shown, and clear relevance to understanding the nature of tanks solutions. Some TAG members believe this could be very useful down the road, especially if processing problems develop, but there was some variance in opinion of long-term utility of this work. This could be another good example to analyze in terms of EMSP success. Some reviewers felt the project's focus on improving Pitzer modeling of tank solution speciation to be appropriate because of the worldwide acceptance of this model. Others felt the ESP model was OK. Either approach requires an improved thermodynamic database.

TFA Response

The TFA concurs.

User Review Comments/Recommendations and TFA Responses

Most of the presentation was not needed/appropriate for this audience. The last couple of minutes including the overall summary should have been the essence of the talk. This reviewer could not, from this presentation, see the value of this work. Need to establish a strong tie to the value of the results.

TFA Response

The TFA recognizes this issue and will be working closely with the PIs on future presentations intended for TFA audiences. The TFA believes this work is of considerable value in two areas: 1) upgrading the ESP program Hanford uses to predict phases and potential line plugging and 2) a better model of Sr speciation in tanks.

(73759) Computational Design of Metal Ion Sequestering Agents

TAG Review Comments/Recommendations and TFA Responses

This project represents a great collaboration with a wide number of universities and with ORNL. Very good work that has resulted in extractant considered for cesium removal at SRS. HostBuilder is a good step forward and will be a great tool for scientists when completed. This could save DOE money and time by identifying new or better separating agents for future uses. One TAG member recommends increasing funding for this effort and another recommends a "direct" line of funding. This work has great potential and is superior to many of the other projects presented.

How is this work transitioned to the user? TFA needs to develop a plan for transitioning all separations work from EMSP to TFA to the user.

Modeling of solvation effects should be considered because of the significance to solvent extraction.

Are there linkages to similar efforts at other national labs? Any BES work in this area?

TFA Response

The TFA believes the transition path for this project is clearer than for other EMSP projects. Dr. Hay's work is dependent upon other, more experimentally oriented, researchers to test and evaluate the modeled ligands. This project is already associated with Moyer's work on solvent extraction. It is our understanding from Dr. Hay that the best modeled candidates are tested by Dr. Moyer under the EMSP program (not sure who's).

In addition, the TFA agrees that solvation should be included in the entire computational model.

User Review Comments/Recommendations and TFA Responses

None provided.

(73778) Investigation of the Fundamental Chemistry of Technetium

TAG Review Comments/Recommendations and TFA Responses

The Tc-tanks work, combined with related work at LANL and elsewhere, presents a convincing story on why technetium behaves as it does in the Hanford tanks. The principal investigators should now consider how the valences might be manipulated in tanks processing to get all the technetium in one desired place. Valence studies as part of this work should be continued in close cooperation with LANL. This is excellent science work that should have been done long ago. However, links to site end users are obscure and these would be helpful in defining future work of interest to TFA.

The Tc cement work also is excellent. Future work on Tc behavior in glasses would be interesting, e.g., what would be reaction in presence of ferrous iron?

TFA Response

The TFA agrees. The LANL EMSP work on this topic has concluded.

User Review Comments/Recommendations and TFA Responses

None provided.

(73803) Next Generation Extractants for Cs Separation from HLW

TAG Review Comments/Recommendations and TFA Responses

This is another "winner" in the EMSP program that needs to be analyzed in terms of success factors. While conducting extremely productive basic science, there is tangible spinoff already evident in ALT-SALT project. Further, if SX is chosen for ALT-SALT baseline, it will continue to be useful to develop the underlying science of the project in case troubleshooting and/or expert opinion is needed. By continuing this work, EM will ensure that a skilled "Swat Team" is available for urgent problems in applications of CsIX. If not chosen as the baseline, EMSP support will ensure that a backup is being developed by a highly qualified and knowledgeable group. Continuation of EMSP funding is essential.

TFA Response

The TFA concurs.

User Review Comments/Recommendations and TFA Responses

This project is an excellent example of how the EMSP adds value to the EM program. Two years ago when SRS abandoned the ITP salt separation approach and began examining alternatives, solvent extraction was viewed as a promising technology but lacking in maturity. This project led by ORNL has, in merely two years' time, brought the maturity level of solvent extraction so far along that it now ranks very favorably among the final three Salt Processing Project alternatives. Even if not ultimately selected as the SRS salt separation technology to be implemented, this project has been an unqualified success. The PI and the ORNL team for this project are to be commended as well for their discipline of challenging the results of their work and looking for flaws in their results. This discipline speaks highly of their professionalism and technical expertise.

TFA Response

The TFA concurs and appreciates the feedback.

(73824) Reactivity of Peroxynitrate: Implications for Hanford Waste Management and Remediation

TAG Review Comments/Recommendations and TFA Responses

The TAG believes that while this work appears to be good science, it is highly skeptical about relevance. This project addresses two types of tanks issues related to peroxynitrate: potential energy storage due to radiation processes in crystalline nitrates (salt cake) and potential use in oxidizing materials such as Cr (III) in tank liquids. Regarding energy storage, neither the PI nor the TAG is aware of any evidence that energy storage by this mechanism has ever been seen in decades of management of nitrates in high rad environments. In addition, the PI indicated that concentrations of peroxynitrate in nitrate solids thus far have been limited to about 0.5 5, even after heavy irradiation. The TAG suggests that TFA connect this PI with Hanford experts who are aware of salt cake testing (e.g., DSC work) that relates to this question. The TAG also is skeptical that peroxynitrate has potential for any treatment applications. TFA needs to help the PI understand the issues for application as a treatment technology.

TFA Response

The TFA agrees that this project has contributed to a better understanding of an interesting oxidation pathway in HLW. The PI's research on peroxynitrate as a potential high energy release would have drawn more attention from a safety aspect but, as the TAG reviewers observed, the total energy storage in peroxynitrate (although energetic) is quite small. This is a valuable result in that it demonstrates little cause for a safety concern. There is a small possibility that there will be interest from site problem holders trying to handle wastes with high organic content. TFA will identify the appropriate site technical personnel and make them aware of this research.

User Review Comments/Recommendations and TFA Responses

None provided.

(73827) Non-invasive Diagnostics for Measuring Physical Properties and Processes in HLW

TAG Review Comments/Recommendations and TFA Responses

This was a well presented topic by a well qualified PI who is interacting effectively with PNL on slurry issues. This is good science ("elegant" to one TAG member) with interesting possibilities for some applications, although the path is much more straight forward for the ultrasonic velocimeter than for nmr imaging due to cost, size and operational complexity considerations. One TAG member believes the real value likely lies in laboratory characterization of simulants rather than on-line application.

TFA Response

The TFA concurs.

User Review Comments/Recommendations and TFA Responses

None provided.

(73832) The NOx System in Homogenous and Heterogeneous Nuclear Waste

TAG Review Comments/Recommendations and TFA Responses

Good presentation by a world class PI. In the past this work has impacted safety analysis in Hanford tanks flammable gas issue resolution, and continues to develop the technical basis for radiolytic/chemical processes during storage. Potential applications in other focus areas too. With one exception, the TAG reviewers strongly endorsed this effort and encourage TFA to engage this work and continued EMSP support. This is another EMSP project that might be useful to analyze in terms of "success".

TFA Response

The TFA agrees that this EMSP project could be very interesting for previously important issues such as H2 generation through radiolysis, however, there is little interest from sites for current or anticipated issues. A special roundtable was arranged between Dr. Meisel and Hanford site users to discuss potential application of this EMSP research towards several potential issues such as, H2 generation, organics reactions, colloid formation, Tc oxidation. The meeting was well attended by Hanford users but little path to application of EMSP results could be developed.

User Review Comments/Recommendations and TFA Responses

None provided.

(73859) Quantify Silica Reactivity in Subsurface Environments

TAG Review Comments/Recommendations and TFA Responses

This appears to be quality basic science by a good team. However, a huge amount of relevant literature has been accumulated in this field over the past fifty years, including double layer modeling in repository scenarios. It is not clear that this project effectively accesses this database.

More realistic experiments should be performed using relevant ground waters, e.g. related to repository sites at 25 degrees Celsius. The choice of hydrothermal waters is a clear indication of a possible disconnect. Glass compositions relevant to HLW should also be utilized. Surface charge experiments used pure salts - again not realistic for HLW repositories. There is no evidence of any meaningful dialogue with repository or HLW scientists or engineers. TFA should assist with such linkages.

This work could be helpful in estimating the dissolution rates of borosilicate glasses placed in repositories. The project should consider cases with multi-metal type glasses of similar nature to "rad" glasses to see impact on dissolution rates. Also tests of dissolution rates should be performed considering double-layer theory modeling. Need to incorporate the equilibrium silicate concentration impact on dissolution.

One TAG member recommends continuing work with borosilicate and iron phosphate glasses to give good fundamental data for glass solubilities. Future work on this project should be redirected to better fit actual HLW needs.

TFA Response

The TFA agrees that this project has an interesting approach to some dissolution mechanisms, however, its relevance to TFA issues is no longer well connected unless it includes relevant glasses (e.g. borosilicate). TFA agrees that changes in direction need to occur if this project is to yield relevant results. TFA will recommend a discussion with the PI and Immobilization TIM, to facilitate making this work more relevant to TFA.

User Review Comments/Recommendations and TFA Responses

Seems that EM needs to gain RW agreement for using the results of this and similar work before it has any benefit to EM. Most comments about the EM/RW interface seem to indicate little near term changes by RW. Seems to have some obvious benefit if program changes (RW) can be made. However, if changes are not made soon, benefit is limited… it would seem.

TFA Response

The TFA believes that EMSP projects like this are a good way to investigate potentially valuable alternatives and develop a driver to consider other forms.

(73896) Acoustic Monitor for Liquid Solid Slurries Measurements at Low Weight Fractions

TAG Review Comments/Recommendations and TFA Responses

TAG comments were somewhat variable on this project, as indicated by the following comments by different reviewers.

Presentation was too theoretical, a real university presentation. Testing should use real materials rather than polystyrene and glass. There was no discussion of how this fits with any previous acoustic work or any available commercial technology.

Good work, but theory does not fit at high volume fractions (>30%). Novel part of the work is the analysis.

Elegant work. May be applicable to slurry transfer operations, indeed one of the only ways to get concentrations for S/L/G mixtures. Some difficulty in seeing the application for an operating problem.

A small but useful extension of well-known and commercially available technology.

The by-pass loop needed to determine the acoustic signal of the supernatant will be a problem for deployment. It requires a cross-flow filter and may be prone to plugging, scaling, etc.

A workshop on slurry monitoring was held 1 ½ years ago. Another workshop should be held where principal investigators get together with TFA and end users at a test bed, perhaps ORNL or FIU.

TFA Response

The TFA has already deployed an ultrasonic based slurry % solids meter. This project appears to provide a theoretical basis for the approach already deployed and demonstrated empirically.

User Review Comments/Recommendations and TFA Responses

None provided.

(73976) Iron Phosphate Glasses: An Alternative for Vitrifying Certain Nuclear Wastes

TAG Review Comments/Recommendations and TFA Responses

This was a well presented exposition by a well known academic glass expert on his work with a glass alternative that might have application to certain Hanford HLW compositions, such as high sulfate/phosphate materials. The PI has made a commendable effort to understand the needs. However, the road to any eventual deployment will be long and arduous, and the TAG would urge the TFA to help the PI make appropriate site contacts to develop a better appreciation for what the critical issues will be that could be considered in the EMSP effort. Examples include how to do meaningful comparisons to performance of other glasses and practicalities of scale up, materials compatibility, feed preparation, melter design and operations, off gas considerations, corrosion, heat transfer, crystalinity, durability, pitfalls of simulants, etc. This work should be continued with closer ties to the site user technology community (i.e., SRTC and PNNL). Eventually should move to testing with real materials, and evaluation of cost/benefit of a second (phosphate) material for problematic feed.

TFA Response

The TFA considers that INEEL should be added as a collaboration focus. The high zirconium and sulfate concentrations in INEEL waste make applicability of this technology to INEEL waste even more interesting than for Hanford or SRS waste.

User Review Comments/Recommendations and TFA Responses

Seems that EM needs to gain RW agreement for using the results of this and similar work before it has any benefit to EM. Most comments about the EM/RW interface seem to indicate little near term changes by RW. Seems to have some obvious benefit if program changes (RW) can be made. However, if changes are not made soon, benefit is limited… it would seem.

TFA Response

The TFA believes that EMSP projects like this are a good way to investigate potentially valuable alternatives and develop a driver to consider other forms.

(74019) Supramolecular Chemistry of Selected Anion Recognition for Anions of Environmental Relevance

TAG Review Comments/Recommendations and TFA Responses

The TAG reviewers expressed a wide range of opinions on this project, as indicated. This work focuses on sulfate removal, which is important for Hanford waste. Also potentially can be applied to nitrate removal and to SRS waste. This is good science that may pay off in the future since new ligands for sulfate and phosphate removal are identified. Also there is potential for application to technetium species that are not anions. Good collaboration indicated with ORNL to look at solvent extraction for removal of anions. Work includes looking to combine cation and anion-specific extractants. Work appears promising and is one of the few current approaches to nitrate and sulfate removal or destruction, but better appreciation of real problem by PI is needed. Recommend the TIM provide the linkage to the user. Solid work technically and rare example of contemporary university work related to separations and potential remediation expertise.

This project should explore potential TcO_4^- application with Moyer at ORNL.

One TAG member wonders why it took so long to reach the conclusion that to extract anions, one should use quaternary ammonium salts (anion exchange).

This has been done for years. Use of a crown for the cation just confuses the issue. If you are trying to remove TcO_4^-, it doesn't matter if it's the acid, Na, K, or Cs form. The four means to extract anions in an opening slide did not show this. It seems that they were suffering from tunnel vision and not reading solvent extraction textbooks.

How will this work be transitioned to the user? TFA needs to develop a plan to transition all separations work from EMSP to TFA to the users.

TFA Response

The TFA agrees that transition plans for all promising EMSP work is needed. This work and Ben Hay's modeling work appear to both be transitioned through the experimental work on solvent extraction. Sulfate separation is very interesting to TFA as a method to avoid sulfate phase separation in the melter. The application of this work to pertechnetate is less interesting. Pertechnetate is not really a problem for either the HLW or LAW waste. There isn't a big driver to move pertechnetate exclusively to HLW. The main concern is pertechnetate formed in the tank residuals after retrieval. There its mobility dominates the performance assessment.

User Review Comments/Recommendations and TFA Responses

None provided.

Appendix G – Summary of Midyear Review Meeting Actions

Technical Response	Action	Assigned To
A9175	The Tanks Focus Area (TFA) will consider (1) developing risk-based methodologies to assess continued operations of tanks and pipelines with potential or existing defects, (2) conducting a risk-based assessment of the degree of examination of tanks needed to determine integrity status, and (3) membership in Center for Nondestructive Evaluation (CNDE) to facilitate interactions with industry and capitalizing on the substantial work done by industry in this area.	Safety Technology Integration Manager (TIM)
A9352	The TFA will revisit the project a year following the deployment to assess the degree of user reliance, ensure sufficient cold-testing for full confidence in all systems and procedures, and consider additional investments in conjunction with the decontamination and dismantlement automation activities of the Decontamination and Decommissioning Focus Area (DDFA) to extend productivity and operational safety.	Retrieval TIM
A9508	The TFA will work with INEEL management to evaluate the need to conduct a follow-up review to ensure the project is progressing consistent with TFA and user needs and expectations. The follow-up review should evaluate the experimental planning documents; past experimental methods, data, results, and conclusions; the technical experience and expertise of experimenters; and the future direction.	Pretreatment TIM, Technology Integration Coordinator
A9768a	The TFA will develop a strategy for evaluation of Idaho National Engineering and Environmental (INEEL) melter technology options, define a set of preliminary melting process requirements and melter capabilities for each potential INEEL waste feed option, define glass property characteristics or requirements that would match up with various candidate melter technologies under evaluation and determine compatibility with viable formulations and optimized waste loadings, and engage both Pacific Northwest National Laboratory (PNNL) and Savannah River Technology Center (SRTC) staff who have performed radioactive waste vitrification studies in hot cells to assist planning scheduled work with actual sodium bearing waste (SBW) samples.	Immobilization TIM
A9768b	The TFA will complete and close the University work performed in conjunction with the program, ensuring the results of the work are documented. In addition, the TFA should consider advanced imaging systems for future melter pour spout tests and evaluations prior to incorporating them into the Defense Waste Processing Facility (DWPF) melter design, and other melter configurations (i.e., a flooded pour spout configuration, a horizontal extension of the riser).	Immobilization TIM
A9777	The TFA will factor Hanford's Waste Treatment and Immobilization Plant needs and planning for disassembly and disposal of melters, coordinate an evaluation of regulatory drivers and costs associated with final disposal of high-level waste (HLW) melter equipment and scrap glass, expand the glass removal development activity to include exploration and development of more innovative solutions, expand the scope or	Immobilization TIM

Technical Response	Action	Assigned To
	initiate a new task to address glass removal as a means of extending melter life when processing high noble metals feeds, and promote a reassessment at DWPF of the feasibility of vacuum extraction of molten glass from the melter as a basis for disposal enhancement or noble metals remediation.	
Various	The TFA will ensure lessons learned and opportunities for technology and experience transfer are documented and communicated to other sites.	Technology Delivery Manager
Various	The TFA will identify and document in the Multiyear Technical Responses (MYTRs) the "TFA Exit Plan", i.e., the point by which TFA involvement should end and the necessary transition.	Technical Program Development Manager
NA	The TFA will identify and communicate the key success factors contributing to the Environmental Management Sciences Program (EMSP) projects that are conducting research and development directly relevant to and well connected with TFA projects.	Research Integration Manager
NA	The TFA will ensure the continued involvement of the TIMs in facilitating EMSP project relevancy to and interactions with TFA projects.	Technology Integration Coordinator

Appendix H – Other FY01 Reviews [a]

MYTR/ Project No.	Project Title	ASME Review	Project Maturity (Gate) Review	Technical Progress Review	Proposal Review
A9143	HLW Tank Corrosion Control and Monitoring -Hanford EN Corrosion Monitoring		X		
A9143	HLW Tank Corrosion Control and Monitoring - SRS EIC/EN Corrosion Monitoring		X		
A9143	HLW Tank Corrosion Control and Monitoring - ORNL Stainless Steel Tanks Corrosion Monitoring		X		
A9171	Alternative Air Filtration Technologies - SRS Tanks		X		
A9171	Alternative Air Filtration Technologies - Calcine Transfer		X		
AA1S1	Pre-closure Interim Tank Maintenance			X	X
A9246	Waste Sampling and At-tank Analysis - Hanford Fluidic Sampler		X		
A9278 [b]	Slurry Transfer and Tank Waste Mixing Monitors - Dual Coriolis Slurry Monitoring			X	
AA202	In-situ Waste Characterization - WV In-tank Radiological Measurment Methods			X	
A9352 [b]	Remote Systems for Pit Operations and Maintenance - Hanford Pit Operations Enhancements		X		
A9352	Remote Systems for Pit Operations and Maintenance – SRS Pit Operations Enhancements		X		
A9359	Waste Mixing and Retrieval - SRS/Hanford Mixer Pump Operational Enhancements			X	
A9365	Waste Transfer Pumping - Variable Depth Transfer Pump		X		
A9365	Waste Transfer Pumping - Temporary Transfer Lines		X		
A9376 [b]	Waste Transfer Line Plugging Prevention/Unplugging	X			
AA3S1	Selective Chemical Dissolution of Tank Heels to Improve Retrieval	X		X	
AA3S2	SST Retrieval from Potential Leaking Tanks	X		X	X

(a) These are reviews planned or completed in FY 2001 in addition to those reviews summarized in this Midyear Review Report

(b) These projects will pilot TSDS evaluations in FY 2001.

A9554	Tank Waste Chemistry - Hanford Waste Transfer/Solids Formation; Salt Cake Dissolution			X	
A9554	Tank Waste Chemistry - Salt Cake Dissolution			X	
AA5S1	Removal of Key Non-radioactive Elements from Tank Waste	X		X	
AA7S2	New Melter Technology			X	
A9923	Enhanced Grout Formulations for Tank Closure				X

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